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STRATIGRAPHIC SECTIONS OF THE PHOSPHORIA FORMATION IN UTAH, 1947–48

By L. E. Smith, G. F. Hosford, R. S. Sears, D. P. Sprouse and M. D. Stewart

UNITED STATES DEPARTMENT OF THE INTERIOR
Oscar L. Chapman, Secretary

GEOLOGICAL SURVEY
W. E. Wrather, Director

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Washington, D. C., 1952

Free on application to the Geological Survey, Washington 25, D. C.

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UNITED STATES DEPARTMENT OF THE INTERIOR
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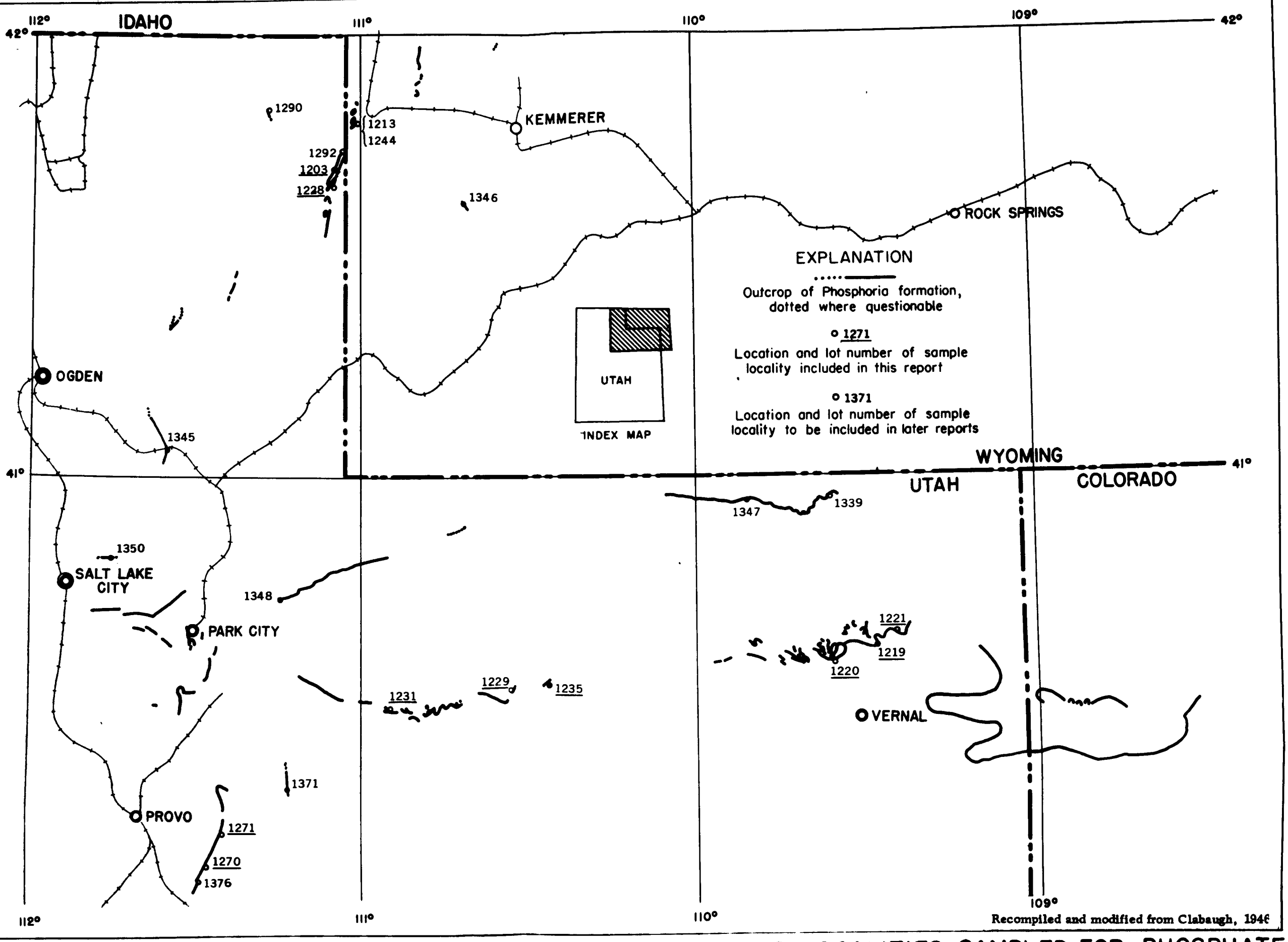
CIRCULAR 211 PLATE 1



Recompiled and modified from Clabaugh, 1946

PHOSPHORIA AND PARK CITY FORMATION OUTCROPS IN UTAH AND LOCALITIES SAMPLED FOR PHOSPHATE

STRATIGRAPHIC SECTIONS OF THE PHOSPHORIA FORMATION IN UTAH, 1947-48

INTRODUCTION

As part of a comprehensive investigation of the phosphate deposits of the western field begun in 1947, the U. S. Geological Survey has measured and sampled the full thickness of the Permian Phosphoria formation and its partial correlative, the Park City formation, at many localities in Utah and other western states. Although these data will not be fully analyzed for several years, segments of the data, accompanied by little or no interpretation, will be published as preliminary reports. This report, which contains abstracts of many of the sections measured in northeastern Utah (pl. 1), is one of this series. The field and laboratory procedures adopted in these investigations are described rather fully in a companion report (McKelvey and others, 1953a).

A large number of people have taken part in this investigation. The program of which this work is a part was organized by V. E. McKelvey. McKelvey, J. W. Huddle, D. M. Kinney, J. B. Collins, R. A. Gulbrandsen, R. A. Hoppin, J. A. Noel, F. W. O'Malley, O. A. Payne, J. F. Rominger, R. P. Sheldon, J. E. Smedley, and R. G. Waring participated in the description of strata and collection of samples referred to in this report. D. B. Dimick, H. A. Larsen, and T. K. Rigby assisted in the preparation of trenches and the crushing and splitting of samples in the field. The laboratory preparation of samples for chemical analysis was done in Denver, Colo., under the direction of W. P. Huleatt.

Most of the chemical analyses reported herein were made for the Survey by the U. S. Bureau of Mines at the Northwest Electrodevelopment Laboratory, Albany, Oreg., under the direction of S. M. Shelton and M. L. Wright. All the samples from one locality (Brazer Canyon) were analyzed in the Chemical Laboratory of the Tennessee Valley Authority at Wilson Dam, Ala. Some of the Al_2O_3, Fe_2O_3, and loss-on-ignition analyses were made in the Trace Elements Section laboratory of the Survey in Washington, D. C., under the direction of J. C. Rabbitt by chemists I. Barlow, A. Caemmerer, J. Greene, N. Guttag, and E. H. Humphrey. The spectrographic analyses were made by D. M. Mortimer, of the Bureau of Mines in Albany.

Compilation of the data has been largely by R. P. Sheldon and F. D. Frieske under the supervision of R. W. Swanson. Organization of the tabular data has been largely by Anita Cozzetto.

Acknowledgments

Special thanks are due J. Steele Williams and A. A. Baker who have given much advice and many suggestions in the field. The cost of these investigations has been borne partly by the Division of Raw Materials of the Atomic Energy Commission. This support is gratefully acknowledged.

Many local residents, property owners, and phosphate companies furnished information, gave access to property, and extended other courtesies to the field parties. The officers of the Humphreys Phosphate Company and the American Smelting and Refining Company have been especially helpful.

STRATIGRAPHY OF THE PHOSPHORIA AND PARK CITY FORMATIONS IN UTAH

The stratigraphy of the Permian Phosphoria formation in the Crawford Mountains of northeastern Utah, near the Idaho-Wyoming corner, is very similar to that in the adjacent states and described in companion reports (McKelvey and others, 1953a and b). It consists of the phosphatic shale member, about 210 feet thick, and the Rex chert member, for which this is the type locality, about 220 feet thick. The upper shale member, present in the adjacent region to the north, is not well defined in this area. Here, as well as to the north, the Phosphoria formation overlies the Pennsylvanian Wells formation, the upper part of which consists chiefly of cherty gray limestone with some thin phosphatic layers. The Phosphoria is overlain by the Triassic Dinwoody formation, consisting of limestone, calcareous siltstone, and sandstone. A generalized section of the Phosphoria formation at Brazer Canyon is shown in figure 1.

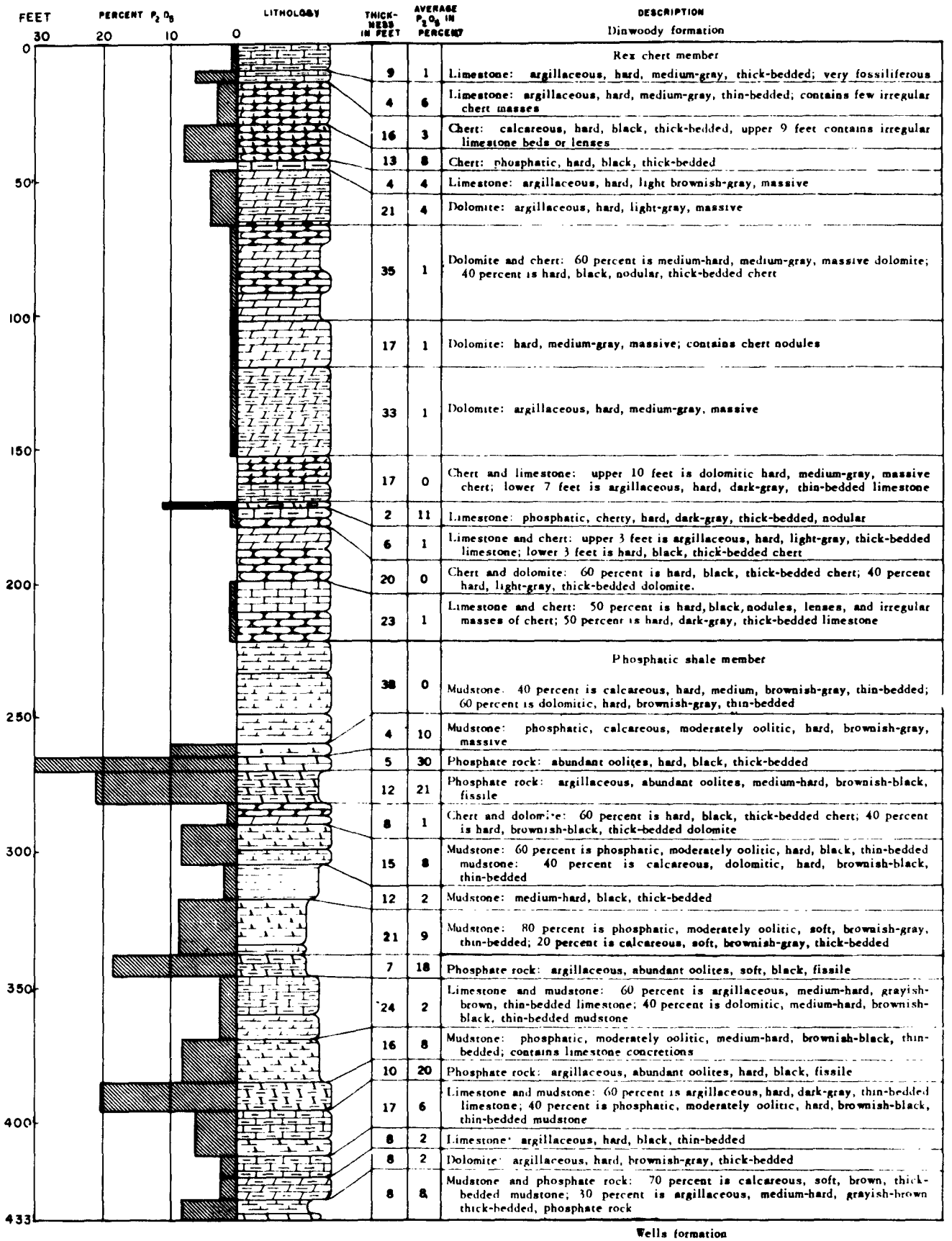
Farther south, along both the north and south flanks of the Uinta Range and in the general area of the Wasatch Range, the Park City formation is the partial stratigraphic equivalent of the Phosphoria formation. At Park City, its type locality, it is about 590 feet thick and consists of a lower limestone member, which may be stratigraphically equivalent to the upper part of the Wells formation in southeastern Idaho; a middle shale member (phosphatic but containing no high-grade phosphate beds) probably equivalent in major part to the phosphatic shale of Idaho; and an upper limestone member, equivalent to the Rex chert member to the north. Eastward the lower limestone member thins out and the phosphatic shale and upper limestone members thin, are more clastic, and finally tongue out into nonmarine redbeds in eastern Utah and western Colorado. Westward the formation thickens markedly, attaining a thickness of several thousand feet, and contains a greater proportion of chemical precipitates.

More detailed correlations of the strata within Utah as well as between Utah and adjacent states will be discussed in subsequent publication.

STRATIGRAPHIC SECTIONS

Analytical data and abstracts of stratigraphic sections measured at 11 localities follow. Their locations as well as the locations of other sections to be reported later are shown in plate 1.

The semiquantitative spectrographic analyses are based upon comparisons with a standard plate representing



Thickness in feet	Average P_2O_5 in percent	Description
		Dinwoody formation
		Rex chert member
9	1	Limestone: argillaceous, hard, medium-gray, thick-bedded; very fossiliferous
4	6	Limestone: argillaceous, hard, medium-gray, thin-bedded; contains few irregular chert masses
16	3	Chert: calcareous, hard, black, thick-bedded, upper 9 feet contains irregular limestone beds or lenses
13	8	Chert: phosphatic, hard, black, thick-bedded
4	4	Limestone: argillaceous, hard, light brownish-gray, massive
21	4	Dolomite: argillaceous, hard, light-gray, massive
35	1	Dolomite and chert: 60 percent is medium-hard, medium-gray, massive dolomite; 40 percent is hard, black, nodular, thick-bedded chert
17	1	Dolomite: hard, medium-gray, massive; contains chert nodules
33	1	Dolomite: argillaceous, hard, medium-gray, massive
17	0	Chert and limestone: upper 10 feet is dolomitic hard, medium-gray, massive chert; lower 7 feet is argillaceous, hard, dark-gray, thin-bedded limestone
2	11	Limestone: phosphatic, cherty, hard, dark-gray, thick-bedded, nodular
6	1	Limestone and chert: upper 3 feet is argillaceous, hard, light-gray, thick-bedded limestone; lower 3 feet is hard, black, thick-bedded chert
20	0	Chert and dolomite: 60 percent is hard, black, thick-bedded chert; 40 percent hard, light-gray, thick-bedded dolomite.
23	1	Limestone and chert: 50 percent is hard, black, nodules, lenses, and irregular masses of chert; 50 percent is hard, dark-gray, thick-bedded limestone
		Phosphatic shale member
38	0	Mudstone: 40 percent is calcareous, hard, medium, brownish-gray, thin-bedded; 60 percent is dolomitic, hard, brownish-gray, thin-bedded
4	10	Mudstone: phosphatic, calcareous, moderately oolitic, hard, brownish-gray, massive
5	30	Phosphate rock: abundant oolites, hard, black, thick-bedded
12	21	Phosphate rock: argillaceous, abundant oolites, medium-hard, brownish-black, fissile
8	1	Chert and dolomite: 60 percent is hard, black, thick-bedded chert; 40 percent is hard, brownish-black, thick-bedded dolomite
15	8	Mudstone: 60 percent is phosphatic, moderately oolitic, hard, black, thin-bedded mudstone: 40 percent is calcareous, dolomitic, hard, brownish-black, thin-bedded
12	2	Mudstone: medium-hard, black, thick-bedded
21	9	Mudstone: 80 percent is phosphatic, moderately oolitic, soft, brownish-gray, thin-bedded; 20 percent is calcareous, soft, brownish-gray, thick-bedded
7	18	Phosphate rock: argillaceous, abundant oolites, soft, black, fissile
24	2	Limestone and mudstone: 60 percent is argillaceous, medium-hard, grayish-brown, thin-bedded limestone; 40 percent is dolomitic, medium-hard, brownish-black, thin-bedded mudstone
16	8	Mudstone: phosphatic, moderately oolitic, medium-hard, brownish-black, thin-bedded; contains limestone concretions
10	20	Phosphate rock: argillaceous, abundant oolites, hard, black, fissile
17	6	Limestone and mudstone: 60 percent is argillaceous, hard, dark-gray, thin-bedded limestone; 40 percent is phosphatic, moderately oolitic, hard, brownish-black, thin-bedded mudstone
8	2	Limestone: argillaceous, hard, black, thin-bedded
8	2	Dolomite: argillaceous, hard, brownish-gray, thick-bedded
8	8	Mudstone and phosphate rock: 70 percent is calcareous, soft, brown, thick-bedded mudstone; 30 percent is argillaceous, medium-hard, grayish-brown thick-bedded, phosphate rock
		Wells formation

Figure 1.--Generalized section of the Phosphoria formation at Brazer Canyon

known quantities of the elements tested for and made at the same exposure. Greater sensitivities for many elements can be obtained by additional exposures. The standard sensitivities for the elements noted in this report are as follows:

Element	Percent	Element	Percent
Al	0.005	Li	0.2
Sb	.05	Mg	.001
As	.1	Mn	.004
Ba	.08	Hg	.1
Be	.001	Mo	.004
Bi	.002	Ni	.01
B	.001	P	.8
Cd	.1	Pt	.01
Ca	.01	Si	.002
Cr	.02	Ag	.001
Co	.01	Na	.05
Cb	.01	Sr	.1
Cu	.001	Ta	1.0
Ga	.05	Sn	.01
Ge	.01	Ti	.002
Au	.01	W	.1
In	.05	V	.01
Fe	.005	Zn	.05
Pb	.1	Zr	.003

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Clabaugh, P. S., 1946, Permian phosphate deposits of Montana, Idaho, Wyoming, and Utah: U. S. Geol. Survey, Strategic Minerals Investigations Preliminary Map 3-198.

McKelvey, V. E., Davidson, D. F., O'Malley, F. W., and Smith, L. E., 1953a, Stratigraphic sections of the Phosphoria formation in Idaho, 1947-48, part I: U. S. Geol. Survey Circular 208.

McKelvey, V. E., Smith, L. E., Hoppin, R. A., and Armstrong, F. C., 1953b, Stratigraphic sections of the Phosphoria formation in Wyoming, 1947-48: U. S. Geol. Survey Circular 210.

BRAZER CANYON, UTAH. LOT NO. 1203.

Phosphoria formation sampled in Brazer Canyon, sec. 18, T. 11 N., R. 8 E., Rich County, Utah, on west limb of Crawford Mountains syncline. Section pieced together from two overlapping hand trenches and natural outcrops. Beds P-1 to P-60 sampled in lower trench, beds P-61 to P-139 sampled in upper trench, and beds R-1 to R-35 sampled in upper trench and natural outcrops. Upper trench overlaps lower trench 40 feet; it and natural outcrops lie 50 feet above lower trench. Beds strike north and dip 60° E. Section measured by V. E. McKelvey, L. E. Smith, and R. A. Hoppin and sampled by R. P. Sheldon, O. A. Payne, R. A. Gulbrandsen, and R. S. Sears in July 1947. Samples analyzed by Tennessee Valley Authority.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)							Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	V_2O_5	F	Loss on ignition	Acid insoluble		
	Dinwoody formation—basal bed only											
Td - 1	Mudstone, calcareous; chert and limestone nodules in lower 0.5 foot	RAH- 99-47	2.0	0.80	11.7	4.1	0.07	--	14.4	62.4	2.0	1.6
	Rex chert member of Phosphoria formation											
R- 35	Limestone, argillaceous; fos. col. no. 47-HW-317[1]	RAH- 98-47	9.2	0.6	1.8	1.2	0.02	--	28.4	30.4	9.2	5.52
R- 34	Limestone, argillaceous	RAH- 97-47	4.2	6.3	2.8	1.9	0.04	--	22.9	30.0	13.4	31.98
R- 33	Chert and limestone	RAH- 96-47	6.8	4.1	3.0	2.2	0.06	--	12.7	56.7	20.2	59.86
R- 32	Chert, calcareous	RAH- 95-47	2.5	2.95	2.4	1.8	0.04	0.41	12.5	61.7	22.7	67.24
R- 31	Chert, calcareous	RAH- 94-47	6.5	3.25	2.1	2.7	0.05	--	10.0	65.8	29.2	88.37
R- 30	Chert, phosphatic	RAH- 93-47	9.3	8.0	2.0	2.6	0.00	0.80	6.1	63.5	38.5	162.77
R- 29	Mudstone, contains chert concretions	RAH- 92-47	1.2	2.10	14.5	5.1	0.07	--	6.7	75.8	39.7	165.29
R- 28	Chert, phosphatic	RAH- 91-47	2.2	13.4	4.6	3.9	0.03	1.6	6.2	48.2	41.9	194.77
R- 27	Limestone, argillaceous, calcareous	RAH- 90-47	3.7	3.85	1.5	2.3	0.05	--	19.0	47.5	45.6	209.02
R- 26	Dolomite	RAH- 89-47	5.9	3.6	0.8	1.1	0.00	0.39	38.1	10.6	51.5	230.26
R- 25	Dolomite, argillaceous	RAH- 88-47	8.7	3.7	0.5	1.0	0.04	--	29.7	26.6	60.2	262.45
R- 24	Dolomite, calcareous, argillaceous	RAH- 87-47	6.1	2.7	0.5	1.4	0.00	0.33	31.8	23.5	66.3	278.92
R- 23	Chert and dolomite	RAH- 86-47	11.8	1.50	2.4	2.0	0.05	--	12.2	65.4	78.1	296.62
R- 22	Dolomite, cherty	RAH- 85-47	10.2	2.0	0.6	0.88	0.05	--	31.7	27.1	88.3	317.02
R- 21	Dolomite, cherty	RAH- 84-47	8.0	0.6	0.7	1.5	0.0	--	28.0	36.5	96.3	321.82
R- 20	Chert and dolomite	RAH- 83-47	5.3	0.2	0.5	1.7	0.04	--	21.6	51.5	101.6	322.88
R- 19	Dolomite	RAH- 82-47	8.8	0.6	0.7	0.63	0.00	--	39.9	12.6	110.4	328.16
R- 18	Dolomite	RAH- 81-47	8.3	0.6	0.7	0.51	0.03	--	43.4	6.0	118.7	333.14
R- 17	Dolomite, argillaceous	RAH- 80-47	4.8	0.8	1.9	1.4	0.0	--	33.2	25.7	123.5	336.98
R- 16	Dolomite, argillaceous	RAH- 79-47	5.0	0.8	1.5	1.9	0.04	0.11	33.0	24.2	128.5	340.98

[1] Fossil collection made by H. Wedow, Paleontology and Stratigraphy Branch, U. S. Geological Survey.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)							Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	V_2O_5	F	Loss on ignition	Acid insoluble		
R- 15	Dolomite, argillaceous	RAH- 78-47	7.1	0.6	2.4	2.3	0.00	--	28.2	35.4	135.6	345.24
R- 14	Dolomite, argillaceous	RAH- 77-47	3.5	0.43	1.5	1.6	0.00	--	35.7	21.0	139.1	346.74
R- 13	Dolomite, argillaceous	RAH- 76-47	4.9	0.50	3.8	2.1	0.04	--	28.7	32.3	144.0	349.19
R- 12	Dolomite, argillaceous; fos. col. no. 47-HW-316	RAH- 75-47	6.9	0.4	3.6	2.0	0.03	--	29.2	32.3	150.9	351.95
R- 11	Chert, dolomitic	RAH- 74-47	10.0	0.25	7.2	2.5	0.0	--	18.8	56.3	160.9	354.45
R- 10	Limestone, argillaceous	RAH- 73-47	7.1	0.60	3.0	1.3	0.05	--	26.7	36.5	168.0	358.71
R- 9	Limestone, phosphatic, cherty	RAH- 72-47	2.4	11.4	2.6	1.9	0.09	--	21.3	20.7	170.4	386.07
R- 8	Mudstone, calcareous	RAH- 71-47	3.4	1.3	0.6	1.1	0.00	--	21.0	47.3	173.8	390.49
R- 7	Chert and limestone	RAH- 70-47	2.8	0.1	2.2	2.9	0.06	--	9.4	75.3	176.6	390.77
R- 6	Chert and dolomite, calcareous	RAH- 69-47	10.0	0.15	2.4	3.1	0.04	--	15.9	60.0	186.6	392.27
R- 5	Chert and dolomite	RAH- 68-47	9.8	0.10	2.45	3.1	0.03	--	9.32	73.3	196.4	393.25
R- 4	Chert and limestone	RAH- 67-47	4.0	1.95	2.3	2.0	0.02	--	15.1	57.4	200.4	401.05
R- 3	Limestone and chert	RAH- 66-47	7.2	0.2	1.1	1.0	0.04	--	24.6	43.3	207.6	402.49
R- 2	Chert and limestone	RAH- 65-47	6.8	1.75	0.8	2.1	0.04	--	16.9	54.0	214.4	414.39
R- 1	Limestone and chert	RAH- 64-47	4.8	0.55	1.1	1.5	0.05	--	22.2	45.2	219.2	417.03
	Phosphatic shale member of Phosphoria formation											
P-140	Limestone, argillaceous, contains chert nodules	LES- 148-47	4.0	0.6	3.5	1.5	0.05	0.09	22.7	46.0	4.0	2.40
P-139	Mudstone, calcareous	LES- 147-47	3.8	0.4	4.0	1.9	0.07	--	20.9	50.0	7.8	3.92
P-138	Mudstone, dolomitic	LES- 146-47	4.1	0.1	5.0	1.9	0.00	--	21.0	50.0	11.9	4.33
P-137	Mudstone, calcareous	LES- 145-47	0.6	0.5	15.0	3.4	0.12	--	17.6	54.5	12.5	4.63
P-136	Mudstone, dolomitic	LES- 144-47	3.7	0.3	5.9	1.9	0.09	--	20.4	52.5	16.2	5.74
P-135	Mudstone, dolomitic	LES- 140-47	4.9	0.2	6.4	2.2	0.13	--	18.0	56.8	21.1	6.72
P-134	Mudstone, dolomitic	LES- 139-47	4.3	0.1	8.5	2.7	0.05	--	16.7	60.1	25.4	7.15
P-133	Mudstone, calcareous, dolomitic	LES- 138-47	2.4	0.3	7.6	2.4	0.06	--	18.4	56.8	27.8	7.87
P-132	Mudstone, calcareous	LES- 137-47	0.7	0.2	10.3	2.6	0.05	--	10.4	73.1	28.5	8.01
P-131	Mudstone	LES- 136-47	2.0	0.2	6.9	3.2	0.11	--	14.5	65.1	30.5	8.41
P-130	Mudstone, dolomitic	LES- 135-47	4.5	0.3	9.1	3.3	0.05	0.14	16.2	61.9	35.0	9.76
P-129	Mudstone, dolomitic	LES- 134-47	3.0	0.1	9.4	2.7	0.02	0.15	16.0	60.9	38.0	10.06
P-128	Mudstone, dolomitic	LES- 133-47	0.2	1.7	10.5	2.9	0.04	0.40	17.5	52.3	38.2	10.40
P-127	Phosphate rock, argillaceous	LES- 143-47	1.2	17.7	1.8	1.4	0.05	--	8.1	33.1	39.4	31.64
P-126	Limestone, phosphatic, and phosphatic, calcareous mudstone	LES- 142-47	1.65	8.7	4.7	1.7	0.14	--	18.6	35.8	41.05	46.00
P-125	Limestone, argillaceous	LES- 141-47	1.2	4.1	5.3	1.9	0.06	--	23.2	35.8	42.25	50.92
P-124	Phosphate rock	RAH- 111-47	1.8	31.5	1.6	0.61	0.17	--	6.8	4.5	44.05	107.62
P-123	Phosphate rock	RAH- 110-47	1.7	31.4	1.8	0.40	0.11	3.5	5.8	1.9	45.75	161.00
P-122	Phosphate rock, argillaceous	RAH- 109-47	0.5	21.0	3.4	1.6	0.06	2.4	8.3	29.4	46.25	171.50
P-121	Phosphate rock	RAH- 108-47	1.3	31.5	1.1	0.63	0.22	--	8.8	4.0	47.55	212.44
P-120	Phosphate rock	RAH- 107-47	0.6	24.0	3.8	1.4	0.28	2.7	13.2	17.2	48.15	226.84

P-119	Phosphate rock	RAH- 106-47	1.4	28.0	2.0	1.0	0.17	3.1	11.1	11.0	49.55	266.04
P-118	Phosphate rock	RAH- 105-47	1.0	25.9	2.5	1.0	0.14	3.0	12.3	13.2	50.55	291.94
P-117	Phosphate rock, argillaceous	RAH- 104-47	0.9	22.7	5.1	1.4	0.25	--	10.8	26.2	51.45	312.38
P-116	Mudstone, dolomitic	RAH- 103-47	2.9	6.5	6.4	1.9	0.03	--	19.7	41.3	54.35	331.23
P-115	Phosphate rock, argillaceous	RAH- 102-47	2.9	23.4	4.4	1.7	0.06	2.8	6.6	25.5	57.25	399.09
P-114	Phosphate rock, lower 0.3 foot cherty	RAH- 101-47	2.0	28.1	2.3	1.5	0.02	3.0	4.0	18.4	59.25	455.29
P-113	Chert	RAH- 100-47	3.8	0.8	0.1	3.4	0.06	0.10	2.2	89.9	63.05	458.33
P-112	Mudstone, dolomitic	VEM-174-47	1.1	0.5	1.5	2.1	0.05	0.07	23.4	64.1	64.15	458.88
P-111	Chert	VEM-173-47	1.2	1.3	6.4	3.7	0.05	0.23	4.3	83.4	65.35	460.44
P-110	Dolomite, cherty	LES- 179-47	1.6	0.4	1.0	1.9	0.05	0.07	29.1	34.5	66.95	461.08
P-109	Phosphate rock	LES- 178-47	1.25	25.3	2.3	1.8	0.09	3.0	6.6	18.9	68.20	492.70
P-108	Mudstone, dolomitic	LES- 177-47	0.5	6.0	6.6	2.5	0.10	--	17.2	43.9	68.70	495.70
P-107	Mudstone, dolomitic	LES- 176-47	2.3	1.6	5.5	2.1	0.02	0.21	20.6	50.1	71.00	499.38
P-106	Phosphate rock, argillaceous	LES- 175-47	0.4	22.0	6.2	2.2	0.07	2.4	7.5	27.6	71.40	508.18
P-105	Mudstone, dolomitic	LES- 174-47	1.7	0.1	8.8	2.9	0.06	-	13.9	66.8	73.10	508.35
P-104	Mudstone	LES- 173-47	0.8	0.8	12.3	3.2	0.05	0.22	4.6	84.3	73.90	508.99
P-103	Phosphate rock and mudstone	LES- 172-47[2]	0.9	17.6	4.9	2.1	0.06	-	16.4	23.5	74.80	524.83
P-102	Mudstone, calcareous	LES- 171-47[2]	0.3	7.5	8.8	3.8	0.09	1.1	24.5	40.5	75.10	527.08
P-101	Mudstone, calcareous, dolomitic	LES- 170-47	0.7	2.3	5.7	2.0	0.05	0.37	23.9	41.3	75.80	528.69
P-100	Phosphate rock and mudstone, calcareous	LES- 169-47	0.9	10.1	6.2	2.1	0.18	--	21.7	28.5	76.70	537.78
P- 99	Mudstone, dolomitic	LES- 168-47	0.5	0.20	8.6	2.3	0.05	0.13	18.2	60.0	77.20	537.88
P- 98	Limestone, argillaceous	LES- 167-47	0.75	0.1	5.0	1.3	0.04	--	30.1	31.2	77.90	537.95
P- 97	Phosphate rock and phosphatic mudstone	LES- 166-47	0.7	17.5	5.7	2.2	0.08	--	15.7	24.4	78.65	551.08
P- 96	Phosphate rock and phosphatic limestone	LES- 165-47	0.6	22.2	2.7	2.0	0.02	2.4	15.6	10.7	79.25	564.40
P- 95	Mudstone, calcareous, phosphatic and limestone	LES- 164-47	1.1	8.3	4.3	1.6	0.04	1.0	27.3	17.7	80.35	573.53
P- 94	Mudstone, phosphatic	LES- 163-47	0.55	9.4	9.6	3.0	0.02	1.0	16.1	45.5	80.90	578.70
P- 93	Mudstone, phosphatic	LES- 162-47	1.1	7.8	11.6	3.4	0.07	--	16.0	48.3	82.00	587.28
P- 92	Limestone	LES- 161-47	2.8	0.3	2.1	0.63	0.04	--	41.0	8.2	84.80	588.12
P- 91	Mudstone	LES- 160-47	0.6	2.3	11.5	3.6	0.25	0.34	11.8	68.5	85.40	589.50
P- 90	Mudstone	LES- 159-47	0.6	0.06	13.0	3.9	0.11	0.17	15.2	70.0	86.00	589.53
P- 89	Mudstone	LES- 158-47	0.3	0.15	14.3	3.7	0.33	0.14	11.2	78.4	86.30	589.58
P- 88	Mudstone	LES- 157-47[2]	0.4	0.2	13.4	3.5	0.23	0.12	10.0	76.5	86.70	589.66
P- 87	Mudstone	LES- 156-47[2]	0.4	2.0	12.6	3.7	0.10	0.40	10.8	74.5	87.10	590.46
P- 86	Mudstone, phosphatic	LES- 155-47	0.4	8.60	9.5	3.4	0.05	1.0	14.4	49.8	87.50	593.90
P- 85	Mudstone, calcareous	LES- 154-47	0.6	5.3	11.0	3.5	0.10	0.64	14.5	50.5	88.10	597.08
P- 84	Dolomite, argillaceous	LES- 153-47	0.9	0.9	5.2	1.7	0.07	--	27.9	35.5	89.00	597.89
P- 83	Mudstone	LES- 152-47	1.0	4.9	11.0	3.0	0.03	--	7.4	71.9	90.00	602.79
P- 82	Mudstone, contains limestone concretions	LES- 151-47	2.2	0.8	9.7	2.7	0.06	0.13	9.5	73.2	92.20	604.55
P- 81	Mudstone	LES- 150-47	1.6	0.3	10.0	2.8	0.02	--	11.6	71.6	93.80	605.03

[2] See silver analyses of selected samples at end of chemical analyses tables.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)							Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	V_2O_5	F	Loss on ignition	Acid insoluble		
P- 80	Mudstone, phosphatic, contains gypsum	LES- 149-47	2.5	8.3	8.0	2.9	0.03	1.0	19.7	43.0	96.30	625.78
P- 79	Limestone, argillaceous	VEM-172-47	1.3	0.2	4.3	1.2	0.08	--	30.3	28.7	97.60	626.04
P- 78	Mudstone and phosphatic mudstone, contains gypsum	VEM-171-47	0.9	3.9	9.0	2.8	0.0	0.59	12.1	60.6	98.50	629.55
P- 77	Mudstone, calcareous, mudstone and phosphate rock	VEM-169-47	1.1	9.0	6.4	0.6	0.05	1.0	13.4	45.1	99.60	639.45
--	Limestone concretion near top of bed P-77	VEM 170-47	(0.9)	1.9	1.5	2.6	0.05	--	37.6	7.5	--	--
P- 76	Mudstone, phosphatic	VEM-168-47	1.3	10.6	8.2	2.3	0.09	--	19.3	34.1	100.90	654.23
P- 75	Phosphate rock, argillaceous, contains gypsum	VEM-167-47	2.2	15.6	5.4	1.8	0.09	1.6	21.2	19.5	103.10	687.54
P- 74	Limestone, argillaceous	VEM-166-47	0.5	2.2	0.3	0.3	0.07	--	40.5	3.00	103.60	688.65
P- 73	Phosphate rock and phosphatic mudstone, contains gypsum	VEM-165-47	0.6	16.4	6.9	2.0	0.22	--	16.1	29.7	104.20	698.49
P- 72	Mudstone, calcareous	VEM-164-47	0.6	1.1	7.5	2.3	0.09	--	24.2	45.9	104.80	699.15
P- 71	Mudstone, phosphatic and limestone	VEM-163-47	1.6	8.5	7.9	2.4	0.13	--	19.0	41.4	106.40	712.75
P- 70	Phosphate rock, argillaceous, contains gypsum	VEM-162-47	2.7	13.9	6.0	1.9	0.10	--	20.7	23.2	109.10	750.28
P- 69	Limestone and calcareous mudstone	VEM-161-47	1.2	1.2	3.8	0.4	0.02	--	40.9	5.1	110.30	751.72
P- 68	Limestone	VEM-160-47	1.4	1.4	2.0	0.6	0.02	0.22	38.5	10.4	111.70	753.68
P- 67	Mudstone, phosphatic, contains gypsum	VEM-159-47	0.9	8.4	8.3	2.5	0.06	--	23.6	35.0	112.60	761.24
P- 66	Mudstone, phosphatic, contains gypsum	VEM-158-47	1.2	8.8	10.5	2.5	0.13	--	21.3	37.7	113.80	771.80
P- 65	Dolomite, argillaceous	VEM-157-47	0.6	2.7	6.2	1.8	0.05	--	29.7	25.6	114.40	773.42
P- 64	Phosphate rock, argillaceous	VEM-156-47	2.0	18.3	6.0	1.9	0.05	--	17.7	23.9	116.40	810.02
P- 63	Phosphate rock	VEM-155-47	2.4	18.0	4.1	1.6	0.12	--	19.3	16.1	118.80	853.22
P- 62	Limestone, dolomitic	VEM-154-47	1.1	2.6	1.7	0.6	0.02	--	37.5	9.7	119.90	856.08
P- 61	Phosphate rock	VEM-153-47	1.0	31.2	2.0	1.5	0.11	--	6.7	7.4	120.90	887.28
P- 60	Phosphate rock, argillaceous	VEM-152-47	0.9	23.6	3.2	1.1	0.06	--	9.0	20.5	121.80	908.52
P- 59	Limestone, argillaceous	VEM-151-47	1.5	2.5	3.0	0.9	0.08	--	30.6	24.2	123.30	912.27
P- 58	Mudstone	VEM-150-47	0.9	6.7	9.4	2.6	0.00	--	13.5	52.9	124.20	918.30
P- 57	Mudstone	VEM-149-47	2.1	4.9	9.4	2.7	0.08	--	14.2	57.5	126.30	928.59
P- 56	Mudstone, dolomitic	VEM-148-47	3.9	0.9	7.4	2.2	0.06	--	21.1	50.9	130.20	932.10
P- 55	Limestone, argillaceous	VEM-147-47	1.7	0.8	5.2	1.3	0.12	--	27.7	35.3	131.90	933.46
P- 54	Mudstone, cherty	VEM-146-47	0.9	4.2	4.9	2.5	0.05	--	9.3	65.6	132.80	937.24
P- 53	Limestone	VEM-145-47	2.3	0.7	1.2	0.5	0.04	0.08	35.5	17.4	135.10	938.85
P- 52	Mudstone, calcareous, and phosphatic limestone	VEM-123-47	2.3	3.0	4.4	1.5	0.00	--	12.9	63.3	137.40	945.75

P- 51	Limestone, dolomitic, argillaceous	VEM-122-47	2.4	0.3	1.3	0.3	0.05	--	34.2	21.3	139.80	946.47
P- 50	Mudstone and chert	VEM-121-47	2.5	3.9	3.9	1.7	0.02	0.54	10.9	64.0	142.30	956.22
P- 49	Dolomite, argillaceous	VEM-120-47	3.2	1.1	1.4	0.4	0.12	--	34.6	20.1	145.50	959.74
P- 48	Mudstone, phosphatic	VEM-119-47	1.5	8.5	4.3	1.4	0.02	0.90	11.6	53.6	147.00	972.49
P- 47	Mudstone, phosphatic	VEM-118-47	2.2	10.35	4.4	1.8	0.05	0.98	9.2	51.2	149.20	995.26
P- 46	Mudstone	VEM-117-47	1.1	0.9	10.5	2.6	0.20	--	11.1	73.9	150.30	996.25
P- 45	Phosphate rock, argillaceous	VEM-116-47	1.0	18.0	3.8	1.2	0.18	--	11.5	31.0	151.30	1,014.25
P- 44	Mudstone, phosphatic	VEM-114-47	1.6	13.9	6.8	1.5	0.18	--	12.2	42.4	152.90	1,036.49
--	Limestone concretion at base of bed P-44	VEM-115-47	(0.9)	0.3	2.1	0.5	0.07	--	35.5	18.5	--	--
P- 43	Limestone, argillaceous	VEM-113-47	1.8	0.1	5.7	1.5	0.05	--	24.2	43.9	154.70	1,036.67
P- 42	Mudstone	VEM-112-47	1.5	7.2	7.1	1.8	0.26	--	14.0	55.5	156.20	1,047.47
--	Limestone concretion near base of bed P-42	VEM-111-47	(0.7)	2.5	0.5	0.4	0.08	0.31	35.2	13.8	--	--
P- 41	Mudstone, phosphatic	VEM-110-47	1.4	13.1	5.7	1.6	0.09	1.2	9.2	49.7	157.60	1,065.81
P- 40	Mudstone, phosphatic	VEM-108-47	2.1	7.8	8.0	2.1	0.14	--	9.7	58.4	159.70	1,082.19
--	Limestone concretion at top of bed P-40	VEM-109-47	(0.7)	1.2	2.0	0.6	0.05	--	34.7	16.4	--	--
P- 39	Mudstone, dolomitic	VEM-107-47	1.4	1.4	9.0	2.3	0.06	--	13.2	66.4	161.10	1,082.15
P- 38	Phosphate rock, argillaceous	VEM-106-47	2.1	22.6	3.9	1.1	0.07	--	9.0	25.1	163.20	1,131.61
P- 37	Limestone	VEM-105-47	1.2	1.0	1.4	0.4	0.07	--	37.8	11.0	164.40	1,132.81
P- 36	Phosphate rock, argillaceous and limestone	LES- 132-47	3.5	22.1	3.0	0.88	0.06	--	9.4	27.2	167.90	1,210.16
P- 35	Phosphate rock, argillaceous	LES- 131-47	2.2	23.8	2.9	0.53	0.05	--	9.3	22.8	170.10	1,262.52
P- 34	Mudstone, calcareous	LES- 130-47	0.6	4.2	3.2	0.78	0.02	--	15.8	56.5	170.70	1,265.04
P- 33	Phosphate rock, argillaceous	LES- 129-47	0.65	18.1	3.9	0.91	0.03	--	9.2	34.8	171.35	1,276.80
P- 32	Limestone	LES- 128-47	1.7	1.8	1.1	0.33	0.05	--	37.2	11.7	173.05	1,279.86
P- 31	Mudstone, calcareous, phosphatic	LES- 127-47	0.8	8.9	3.6	1.0	0.04	--	15.2	46.1	173.85	1,286.98
P- 30	Mudstone, phosphatic	LES- 126-47	1.45	11.35	6.8	1.6	0.08	1.4	10.6	45.5	175.30	1,303.44
P- 29	Limestone, argillaceous	LES- 125-47	0.95	5.9	3.3	1.2	0.09	--	20.5	37.0	176.25	1,309.04
P- 28	Phosphate rock, argillaceous	LES- 124-47	0.8	17.0	6.8	1.3	0.06	--	11.9	30.5	177.05	1,322.64
P- 27	Chert, calcareous	LES- 123-47	0.4	1.8	1.7	1.3	0.00	0.24	16.2	56.4	177.45	1,323.36
P- 26	Limestone	LES- 122-47	1.8	0.5	1.1	0.25	0.06	--	37.7	12.4	179.25	1,324.26
P- 25	Phosphate rock, calcareous, and argillaceous limestone	LES- 121-47	1.0	11.9	7.0	1.4	0.04	--	16.2	32.6	180.25	1,336.16
P- 24	Chert, dolomitic	LES- 120-47	0.6	3.8	1.9	2.2	0.07	--	11.3	62.3	180.85	1,338.44
P- 23	Limestone and chert	LES- 119-47	1.0	3.0	1.8	0.85	0.05	--	24.3	35.9	181.85	1,341.44
P- 22	Limestone	LES- 118-47	1.3	1.2	0.7	0.21	0.04	0.18	37.7	10.1	183.15	1,343.00
P- 21	Mudstone, calcareous	LES- 117-47	1.2	1.5	1.4	0.24	<0.01	0.09	10.8	65.8	184.35	1,344.80
P- 20	Limestone	VEM-144-47	1.0	1.0	0.2	0.2	0.07	0.13	37.3	10.7	185.35	1,345.80
P- 19	Limestone, phosphatic, argillaceous; fos. col. no. 47-HW-313	VEM-143-47	2.3	8.4	3.5	0.7	0.08	--	24.8	21.4	187.65	1,365.12

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)							Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	V_2O_5	F	Loss on ignition	Acid insoluble		
P- 18	Limestone, phosphatic; fos. col. nos. 47-HW-312 and 47-HW-312 A	VEM-142-47	0.6	12.4	1.9	0.7	0.04	1.3	21.5	18.8	188.25	1,371.56
P- 17	Limestone; fos. col. no. 47-HW-311	VEM-141-47	1.55	0.5	1.9	0.3	0.11	--	35.4	17.1	189.80	1,373.34
P- 16	Limestone, argillaceous; fos. col. no. 47-HW-310	VEM-140-47	2.0	1.8	2.2	0.6	0.18	--	31.6	24.7	191.80	1,376.94
	Limestone concretion at top of bed P-16; thickness of beds P-16 and P-17 irregular.											
P- 15	Dolomite, argillaceous	VEM-139-47	2.3	1.9	4.0	1.2	0.05	--	24.5	42.6	194.10	1,381.31
P- 14	Mudstone, dolomitic	VEM-138-47	0.8	4.1	3.8	1.6	0.03	0.58	24.9	33.7	194.90	1,384.59
P- 13	Limestone, cherty; fos. col. no. 47-HW-309	VEM-137-47	1.5	1.9	1.9	0.5	0.0	0.15	33.0	20.9	196.40	1,387.44
P- 12	Dolomite, argillaceous	VEM-136-47	1.5	3.1	3.9	1.2	0.0	0.41	26.3	33.0	197.90	1,392.09
P- 11	Dolomite, argillaceous	VEM-135-47	2.6	2.2	3.5	1.1	0.0	0.34	27.9	32.0	200.50	1,397.81
P- 10	Dolomite, calcareous, argillaceous	VEM-134-47	2.2	1.8	2.2	0.8	0.00	0.16	33.2	23.2	202.70	1,401.77
P- 9	Dolomite, calcareous, argillaceous	VEM-133-47	1.7	1.7	3.2	1.0	0.05	--	31.8	25.5	204.40	1,404.66
P- 8	Phosphate rock and phosphatic mudstone	VEM-132-47	1.3	22.9	1.1	1.4	0.18	--	11.0	18.5	205.70	1,434.43
P- 7	Dolomite, argillaceous	VEM-131-47	0.6	7.5	5.2	2.0	0.21	0.82	25.5	31.3	206.30	1,438.93
P- 6	Phosphate rock	VEM-130-47	0.7	26.3	2.8	1.0	0.16	2.9	8.7	13.0	207.00	1,457.34
P- 5	Mudstone, dolomitic	VEM-129-47	0.7	0.3	8.4	2.1	0.08	0.16	15.6	63.6	207.70	1,457.55
P- 4	Mudstone, calcareous	VEM-128-47	1.9	0.1	6.8	1.4	0.12	--	16.8	61.8	209.60	1,457.74
P- 3	Mudstone	VEM 127-47	1.0	0.4	10.2	2.5	0.10	0.15	12.2	66.0	210.60	1,458.14
P- 2	Mudstone, calcareous	VEM-126-47	1.2	0.4	6.7	1.4	0.07	0.13	17.5	57.4	211.80	1,458.62
P- 1	Phosphate rock; fos. col. no. 47-HW-308	VEM-125-47	0.4	28.6	1.8	0.5	0.12	--	5.5	12.8	212.20	1,470.06
	Wells formation											
Cw- 1	Dolomite, calcareous	VEM-124-47	3.6	2.2	0.8	0.5	0.16	--	36.8	14.8	3.6	--

Additional analyses of Brazer Canyon samples

Bed no.	Sample no.	SiO_2	CaO	MgO	Na_2O	K_2O	TiO_2	H_2O-	CO_2	S as SO_3
Trd - 1	RAH- 99-47	48.36	12.40	1.90	--	--	0.62	0.98	9.80	--
R- 35	RAH- 96-47	29.72	35.70	1.20	--	--	0.09	0.24	27.7	--
R- 34	RAH- 97-47	28.42	--	--	--	--	0.07	0.33	21.5	--
R- 33	RAH- 96-47	54.72	19.0	1.90	--	--	0.14	0.34	11.4	--
R- 32	RAH- 95-47	56.76	17.60	1.40	0.55	0.70	0.09	0.16	11.5	0.27
R- 31	RAH- 94-47	62.22	14.00	2.0	--	--	0.08	0.26	9.7	0.33
R- 30	RAH- 93-47	60.80	15.6	1.3	0.52	0.67	0.08	0.26	5.1	0.54
R- 29	RAH- 92-47	57.02	4.40	1.2	--	--	0.61	2.65	0.70	0.16
R- 28	RAH- 91-47	43.18	21.00	1.6	0.64	1.20	0.24	0.48	3.5	0.77
R- 27	RAH- 90-47	42.60	18.80	8.0	--	--	0.09	0.06	18.8	--
R- 26	RAH- 89-47	10.02	29.0	16.4	0.54	0.37	0.05	0.17	37.9	0.13
R- 25	RAH- 88-47	25.82	25.60	12.9	--	--	0.04	0.10	30.2	--
R- 24	RAH- 87-47	22.82	25.00	6.8	0.52	0.35	0.05	0.09	31.4	0.08
R- 23	RAH- 86-47	62.34	11.20	5.1	--	--	0.05	0.07	12.8	--
R- 22	RAH- 85-47	26.30	24.80	13.3	--	--	0.03	0.06	31.3	--
R- 21	RAH- -84-47	36.14	20.2	12.2	--	--	0.03	0.10	28.0	--
R- 20	RAH- 83-47	50.58	15.4	9.6	--	--	0.03	0.11	21.9	--
R- 19	RAH- 82-47	12.18	27.16	17.7	--	--	0.05	0.13	40.0	--
R- 18	RAH- 81-47	5.78	31.60	19.1	--	--	0.04	0.04	43.1	--
R- 17	RAH- 80-47	23.78	25.4	13.1	--	--	0.10	0.08	33.0	--
R- 16	RAH- 79-47	23.52	26.00	12.8	0.49	0.49	0.14	0.15	32.4	0.08
R- 15	RAH- 78-47	31.30	21.00	11.4	--	--	0.20	0.32	27.1	--
R- 14	RAH- 77-47	19.70	26.60	14.0	--	--	0.07	0.05	34.7	--
R- 13	RAH- 76-47	28.94	22.30	10.2	--	--	0.22	0.16	27.5	--
R- 12	RAH- 75-47	29.86	21.8	11.4	--	--	0.23	0.22	28.4	--
R- 11	RAH- 74-47	47.32	13.20	6.5	-	--	0.39	0.40	16.8	--
R- 10	RAH- 73-47	33.00	30.00	2.9	--	--	0.18	0.31	24.9	0.17
R- 9	RAH- 72-47	19.46	--	- --	0.80	1.05	0.14	0.38	20.2	--
R- 8	RAH- 71-47	47.50	25.60	2.5	0.35	0.40	0.06	0.16	20.6	0.14
R- 7	RAH- 70-47	71.26	--	--	--	--	0.04	0.15	9.1	--
R- 6	RAH- 69-47	55.94	13.60	5.0	--	--	0.16	0.12	15.6	--
R- 5	RAH- 68-47	68.16	7.80	3.0	--	--	0.12	0.19	9.1	0.14
R- 4	RAH- 67-47	53.08	18.30	1.8	--	--	0.16	0.15	14.4	--
R- 3	RAH- 66-47	41.80	--	--	--	--	0.05	0.15	24.2	--
R- 2	RAH- 65-57	52.10	21.00	2.2	0.77	0.40	0.07	0.11	16.7	0.24
R- 1	RAH- 64-47	43.86	24.20	2.6	--	--	0.08	0.28	21.7	--
P-140	LES- 148-47	41.86	26.40	1.8	0.84	0.89	0.19	0.29	20.9	0.30
P-139	LES- 147-47	44.98	--	--	--	--	0.14	0.33	19.8	--
P-138	LES- 146-47	45.48	--	--	0.92	1.30	0.30	0.43	19.5	--
P-137	LES- 145-47	42.26	--	--	0.82	3.00	0.15	1.43	12.1	--

Bed no.	Sample no.	SiO_2	CaO	MgO	Na_2O	K_2O	TiO_2	H_2O-	CO_2	S as SO_3
P-136	LES- 144-47	47.90	--	--	--	--	0.28	0.43	18.2	--
P-135	LES- 140-47	50.64	--	--	0.87	1.20	0.32	0.40	15.9	--
P-134	LES- 139-47	52.08	--	--	--	--	0.15	0.68	13.8	--
P-133	LES- 138-47	51.28	--	--	--	--	0.38	0.55	15.6	--
P-132	LES- 137-47	62.26	--	--	1.07	2.10	0.52	0.80	6.6	--
P-131	LES- 136-47	54.16	--	--	1.05	2.10	0.50	0.65	10.8	--
P-130	LES- 135-47	47.80	10.20	6.2	1.00	2.14	0.43	0.59	13.0	0.21
P-129	LES- 134-47	53.00	11.00	5.6	0.70	2.00	0.40	0.62	13.1	0.22
P-128	LES- 133-47	44.50	12.40	6.1	0.62	2.05	0.44	0.92	12.9	0.41
P-127	LES- 143-47	33.74	--	--	0.95	0.80	0.08	0.30	6.8	--
P-126	LES- 142-47	32.34	--	--	0.84	1.10	0.27	0.38	16.8	--
P-125	LES- 141-47	30.58	--	--	--	--	0.31	0.38	21.7	--
P-124	RAH- 111-47	4.56	--	--	1.30	0.80	0.08	0.45	4.8	--
P-123	RAH- 110-47	3.50	52.40	0.19	1.30	0.59	0.03	0.33	4.3	2.8
P-122	RAH- 109-47	27.00	32.60	1.5	1.30	1.1	0.28	0.54	3.6	2.1
P-121	RAH- 108-47	4.86	--	--	1.35	0.70	0.06	0.65	3.9	--
P-120	RAH- 107-47	17.00	36.4	0.96	1.20	1.40	0.18	1.71	2.0	3.1
P-119	RAH- 106-47	11.08	40.90	0.80	1.30	0.70	0.12	1.30	2.0	3.3
P-118	RAH- 105-47	13.30	39.50	0.78	1.24	0.80	0.13	1.66	2.0	3.6
P-117	RAH- 104-47	22.58	--	--	1.40	1.50	0.22	1.40	1.5	--
P-116	RAH- 103-47	34.30	--	--	1.40	1.70	0.41	0.65	16.3	--
P-115	RAH- 102-47	23.90	35.20	0.50	1.40	1.20	0.23	0.69	1.4	2.1
P-114	RAH- 101-47	18.00	41.40	0.21	1.50	0.80	0.18	0.30	1.5	2.1
P-113	RAH- 100-47	82.94[3]	1.60	0.19	0.65	1.40	0.27	0.33	0.40	0.35
P-112	VEM-174-47	43.06[3]	17.60	9.2	0.62	0.59	0.07	0.18	23.3	0.21
P-111	VEM-173-47	77.02	2.40	0.78	0.52	2.00	0.27	0.42	1.4	0.53
P-110	LES- 179-47	32.88	21.40	12.0	0.69	0.40	0.04	0.08	28.6	0.24
P-109	LES- 178-47	19.00	39.80	1.0	1.10	0.89	0.10	0.44	4.3	1.7
P-108	LES- 177-47	37.00	--	--	1.50	1.40	0.39	0.45	15.0	--
P-107	LES- 176-47	41.76	15.80	8.3	1.49	1.90	0.38	0.18	19.7	0.23
P-106	LES- 175-47	25.00	32.40	0.59	1.40	1.60	0.32	1.09	1.4	2.2
P-105	LES- 174-47	55.56	--	--	--	--	0.51	0.28	12.2	--
P-104	LES- 173-47	68.82	2.40	0.61	2.00	3.50	0.53	0.53	0.55	0.40
P-103	LES- 172-47	21.24	--	--	0.90	1.30	0.23	2.13	4.6	--
P-102	LES- 171-47[2,4]	25.14	12.80	2.1	0.64	2.10	0.33	4.47	0.55	4.2
P-101	LES- 170-47	35.18	21.76	4.1	0.94	1.50	0.36	1.10	19.0	1.0
P-100	LES- 169-47	24.52	--	--	0.99	1.70	0.27	1.90	13.4	--
P- 99	LES- 168-47	48.46	11.80	4.3	1.40	2.50	0.50	0.87	12.4	1.2
P- 98	LES- 167-47	26.00	--	--	--	--	0.26	0.43	28.0	--
P- 97	LES- 166-47	22.42	--	--	1.14	1.30	0.26	1.60	5.6	--

P- 96	LES- 165-47	11.10	40.80	0.76	0.92	1.00	0.09	1.54	8.0	2.7
P- 95	LES- 164-47	15.50	39.04	1.3	0.73	1.40	0.16	1.48	21.1	2.1
P- 94	LES- 163-47	36.86	18.96	1.6	0.97	2.60	0.43	2.17	4.8	2.7
P- 93	LES- 162-47	40.16	--	--	0.95	2.90	0.39	2.35	4.2	--
P- 92	LES- 161-47	6.64	--	--	0.57	0.60	0.08	0.25	39.2	--
P- 91	LES- 160-47	54.24	6.20	1.1	1.30	3.10	0.50	1.73	2.0	1.5
P- 90	LES- 159-47[4]	55.62	0.80	1.1	0.99	3.50	0.55	2.52	0.10	2.3
P- 89	LES- 158-47	60.06	0.60	0.87	1.4	3.60	0.65	1.62	0.18	1.5
P- 88	LES- 157-47[2]	63.90	0.60	0.30	1.60	3.80	0.63	1.45	0.30	1.4
P- 87	LES- 156-47[2]	57.32	4.10	2.32	1.40	3.30	0.59	1.76	0.25	1.5
P- 86	LES- 155-47	39.76	15.00	0.93	1.10	2.79	0.46	2.20	2.2	2.5
P- 85	LES- 154-47	41.68	17.20	1.1	0.99	2.40	0.46	1.30	7.6	1.2
P- 84	LES- 153-47	29.44	--	--	1.20	1.30	0.31	0.48	26.0	--
P- 83	LES- 152-47	59.10	--	--	1.47	2.70	0.55	0.95	1.5	--
P- 82	LES- 151-47	60.58	7.60	1.8	2.00	2.80	0.54	1.24	5.3	2.3
P- 81	LES- 150-47	59.10	--	--	1.75	2.50	0.55	0.93	7.4	--
P- 80	LES- 149-47	36.40	17.90	0.89	0.90	2.20	0.41	3.42	2.6	7.0
P- 79	VEM-172-47	23.44	--	--	1.10	1.10	0.26	0.65	27.8	--
P- 78	VEM-171-47	49.10	11.60	1.3	1.30	2.30	0.49	2.67	2.8	5.8
P- 77	VEM-169-47	35.85	21.40	1.0	1.40	1.80	0.41	1.90	6.5	3.3
--	VEM-170-47	6.30	--	--	0.75	0.70	0.09	0.18	36.5	--
P- 76	VEM-168-47[4]	29.04	--	--	0.89	1.80	0.36	3.40	5.6	--
P- 75	VEM-167-47	18.60	31.60	1.1	0.94	1.50	0.21	3.73	5.0	7.5
P- 74	VEM-166-47	2.88	--	--	0.65	0.70	0.02	0.55	38.1	--
P- 73	VEM-165-47	26.10	--	--	1.15	1.90	0.32	2.60	1.7	--
P- 72	VEM-164-47	37.72	--	--	1.64	2.00	0.38	1.70	16.6	--
P- 71	VEM-163-47	34.92	--	--	1.45	1.90	0.39	2.55	5.9	--
P- 70	VEM-162-47	19.36	--	--	0.77	1.70	0.26	3.20	7.9	--
P- 69	VEM-161-47	4.00	--	--	0.64	0.70	0.05	0.38	39.5	--
P- 68	VEM 160-47	8.22	46.40	1.3	0.66	0.97	0.12	0.58	35.2	0.79
P- 67	VEM-159-47	29.04	--	--	0.72	2.30	0.33	4.33	5.0	--
P- 66	VEM-158-47	31.24	--	--	0.84	2.70	0.35	3.33	4.1	--
P- 65	VEM-157-47	20.00	--	--	0.47	1.40	0.24	1.88	24.8	--
P- 64	VEM-156-47	21.08	--	--	0.97	1.50	0.22	3.08	2.4	--
P- 63	VEM-155-47	14.94	--	--	0.85	1.20	0.17	2.43	6.8	--
P- 62	VEM-154-47	8.02	--	--	0.64	0.80	0.12	0.63	34.6	--
P- 61	VEM-153-47	8.76	--	--	0.97	0.10	0.07	0.80	2.4	--
P- 60	VEM-152-47	20.60	--	--	1.00	1.20	0.16	0.58	5.0	--
P- 59	VEM-151-47	20.82	--	--	0.87	0.87	0.16	0.33	29.1	--
P- 58	VEM-150-47	45.20	--	--	0.97	2.70	0.41	0.98	7.3	--
P- 57	VEM-149-47	48.96	--	--	1.14	2.70	0.37	1.20	7.3	--

[2] See silver analyses of selected samples at end of chemical analyses tables.
[3] The SiO_2 analysis for this sample is probably in error.
[4] The analytical data for this sample fail to account for much of the total sample and are therefore questioned.

Bed no.	Sample no.	SiO_2	CaO	MgO	Na_2O	K_2O	TiO_2	H_2O-	CO_2	S as SO_3
P- 56	VEM-148-47	41.58	--	--	1.00	2.00	0.37	0.85	17.1	--
P- 55	VEM-147-47	30.24	--	--	0.60	1.20	0.20	0.48	25.1	--
P- 54	VEM-146-47	60.94	--	--	0.52	1.10	0.16	0.48	6.0	--
P- 53	VEM-145-47	16.28	42.40	2.2	0.42	0.80	0.06	0.15	34.6	0.37
P- 52	VEM-123-47	59.56	--	--	0.70	1.90	0.22	0.45	9.9	--
P- 51	VEM-122-47	20.20	--	--	0.30	0.50	0.07	0.18	32.9	--
P- 50	VEM-121-47	56.64	12.6	1.7	0.59	1.30	0.22	0.49	7.5	0.63
P- 49	VEM-120-47	19.12	--	--	0.57	0.47	0.06	0.08	33.4	--
P- 48	VEM-119-47	49.82	17.90	2.7	0.60	1.40	0.20	0.67	7.7	1.1
P- 47	VEM-118-47	45.80	20.00	1.7	0.74	1.70	0.22	0.53	6.1	1.1
P- 46	VEM-117-47	61.92	--	--	0.84	3.20	0.55	0.95	5.2	--
P- 45	VEM-116-47	30.30	--	--	0.90	1.10	0.24	1.28	4.3	--
P- 44	VEM-114-47	38.00	--	--	1.09	2.00	0.34	1.70	3.0	--
--	VEM-115-47	16.28	--	--	0.64	0.60	0.11	0.28	33.9	--
P- 43	VEM-113-47	37.68	--	--	--	--	0.35	0.50	21.9	--
P- 42	VEM-112-47	48.92	--	--	1.19	2.30	0.36	1.70	4.1	--
--	VEM-111-47	12.48	46.20	0.94	0.95	0.30	0.09	0.22	33.8	0.71
P- 41	VEM-110-47	43.30	20.40	0.66	1.30	1.90	0.41	1.28	2.0	1.9
P- 40	VEM-108-47	50.12	--	--	1.25	2.80	0.51	1.28	2.9	--
--	VEM-109-47	14.42	--	--	--	--	0.12	0.18	33.3	--
P- 39	VEM-107-47	55.56	--	--	--	--	0.17	0.45	11.1	--
P- 38	VEM-106-47	22.96	--	--	--	--	0.21	1.08	2.6	--
P- 37	VEM-105-47	10.16	--	--	--	--	0.07	0.15	37.2	--
P- 36	LES- 132-47	26.16	--	--	--	--	0.18	0.93	3.7	--
P- 35	LES- 131-47	21.44	37.60	0.60	1.00	1.00	0.14	0.82	3.1	2.4
P- 34	LES- 130-47	56.10	18.20	1.2	0.45	1.03	0.14	0.54	12.6	1.0
P- 33	LES- 129-47	33.48	30.60	0.60	0.77	1.30	0.18	0.87	4.0	1.8
P- 32	LES- 128-47	11.16	--	--	0.60	0.70	0.04	0.15	36.2	--
P- 31	LES- 127-47	43.80	--	--	0.69	1.20	0.20	0.68	10.6	--
P- 30	LES- 126-47	39.80	22.40	1.2	0.85	2.40	0.35	0.95	5.2	1.5
P- 29	LES- 125-47	34.52	--	--	0.64	1.30	0.14	0.45	18.1	--
P- 28	LES- 124-47	27.66	--	--	0.95	1.90	0.25	0.75	5.7	--
P- 27	LES- 123-47	55.38	21.50	0.89	0.40	0.60	0.06	0.24	14.9	0.35
P- 26	LES- 122-47	11.56	--	--	0.57	0.70	0.05	0.08	36.9	--
P- 25	LES- 121-47	28.98	--	--	0.80	1.90	0.29	0.58	12.4	--
P- 24	LES- 120-47	60.22	--	--	0.62	0.80	0.07	0.33	10.5	--
P- 23	LES- 119-47	33.88	--	--	--	--	0.03	0.33	23.3	--
P- 22	LES- 118-47	10.10	50.80	0.66	0.50	0.30	0.05	0.16	37.3	0.27
P- 21	LES- 117-47	64.1	13.7	0.61	0.2	1.0	0.2	0.2	36.7[5]	0.32
P- 20	VEM-144-47	10.86	49.20	0.59	0.68	0.40	0.03	0.15	36.8	0.31

P- 19	VEM-143-47	19.16	--	--	0.60	1.20	0.16	0.40	22.5	--
P- 18	VEM-142-47	18.80	42.60	1.1	0.84	0.69	0.09	0.19	20.4	1.0
P- 17	VEM-141-47	16.16	--	--	0.40	0.50	0.08	0.18	34.4	--
P- 16	VEM-140-47	23.10	--	--	0.54	0.60	0.09	0.20	30.3	--
P- 15	VEM-139-47	38.92	--	--	0.55	1.00	0.07	0.33	22.8	--
P- 14	VEM-138-47	29.34	22.80	9.1	0.60	1.20	0.21	0.31	23.4	0.52
P- 13	VEM-137-47	20.28	39.80	2.6	0.50	0.57	0.07	0.14	31.9	0.22
P- 12	VEM-136-47	30.66	23.60	9.4	0.65	1.20	0.16	0.32	25.0	0.47
P- 11	VEM-135-47	28.92	24.80	9.0	0.55	1.00	0.14	0.31	26.2	0.45
P- 10	VEM-134-47	20.82	28.8	9.6	0.54	0.70	0.11	0.28	31.5	0.43
P- 9	VEM-133-47	22.44	--	--	--	--	0.15	0.45	29.9	--
P- 8	VEM-132-47	19.36	--	--	1.10	1.10	0.16	1.28	3.7	--
P- 7	VEM-131-47	26.46	22.40	6.4	0.75	2.0	0.25	1.95	14.5	2.4
P- 6	VEM-130-47	15.32	40.84	1.1	1.30	1.20	0.12	0.76	3.4	3.0
P- 5	VEM-129-47	51.74	10.00	5.6	0.47	2.40	0.50	0.63	12.0	0.45
P- 4	VEM-128-47	54.38	--	--	0.34	1.80	0.45	0.43	14.7	--
P- 3	VEM-127-47	60.12	6.40	3.0	0.43	2.80	0.46	0.85	7.2	0.65
P- 2	VEM-126-47	51.40	11.20	6.5	0.50	2.00	0.44	0.39	15.1	0.22
P- 1	VEM-125-47	13.66	--	--	1.00	0.60	0.09	0.38	4.2	--
Cw- 1	VEM-124-47	13.88	--	--	0.54	0.60	0.03	0.03	36.6	--

[5] The CO_2 analysis for this sample is probably in error.

Silver analyses of selected samples[6]

Bed no.	Sample no.	Percent Ag
P-102	LES-171-47	0.0010
P- 87	LES-157-47	0.0004
P- 86	LES-156-47	0.0003

[6] Analyses made by U. S. Geological Survey, Geochemistry and Petrology Branch.

SPECTROGRAPHIC ANALYSES—BRAZER CANYON, UTAH. LOT NO. 1203.

Semi-quantitative analyses of samples of the phosphatic shale member of Phosphoria formation, Brazer Canyon, Utah (see immediately preceding pages for location of section, thickness and description of strata, and chemical analyses of samples), made by the U. S. Bureau of Mines Laboratory, Albany, Oregon. In addition to the elements listed in the table below, Sb, As, Be, Bi, Cd, Co, Cb, Ga, Ge, Au, In, Li, Hg, Pt, Ta, Sn, and W were looked for in all samples but were not detected.

Explanation of symbols

A = more than 10 percent
B = 5-10 percent
C = 1-5 percent
D = 0.1-1 percent
E = 0.01-0.1 percent
F = 0.001-0.01 percent
G = Less than 0.001 percent
ND = Not detected

Bed no.	Sample no.	Al	Ba	B	Ca	Cr	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Si	Ag	Na	Sr	Ti	V	Zn	Zr
Trd-1	RAH- 99-47	B	E	E	B	F	G	C	ND	D	E	F	E	A	ND	E	E	D	E	ND	E
R- 35	RAH- 98-47	C	ND	F	A	E	G	C	E	D	E	F	F	A	ND	E	E	E	E	E	F
	Bed R-34 not analyzed.																				
R- 33	RAH- 96-47	C	ND	F	A	E	G	C	E	C	E	F	F	A	ND	E	E	E	E	E	E
R- 32	RAH- 95-47	C	ND	F	A	E	G	C	ND	D	E	F	F	A	G	E	E	E	E	E	F
R- 31	RAH- 94-47	C	E	E	A	E	G	B	E	C	E	F	E	A	ND	E	E	E	E	E	E
R- 30	RAH- 93-47	C	ND	F	A	E	G	C	ND	D	E	F	E	A	G	D	E	E	E	E	F
R- 29	RAH- 92-47	B	E	E	C	E	G	B	E	D	E	F	E	A	ND	E	E	D	E	E	E
R- 28	RAH- 91-47	B	ND	E	A	E	G	C	E	C	E	F	E	A	G	D	D	D	E	E	E
R- 27	RAH- 90-47	D	E	F	A	F	G	C	ND	B	E	F	E	A	ND	E	E	E	E	ND	E
R- 26	RAH- 89-47	D	ND	ND	A	E	G	C	ND	B	E	F	F	A	ND	E	F	E	E	ND	F
R- 25	RAH- 88-47	D	ND	F	A	E	G	C	ND	B	E	F	F	A	ND	E	E	E	E	E	F
R- 24	RAH- 87-47	D	ND	F	A	E	G	C	ND	B	E	F	F	A	G	E	E	E	E	ND	F
R- 23	RAH- 86-47	C	E	F	B	F	G	C	ND	C	E	F	E	A	ND	E	ND	E	E	E	E
R- 22	RAH- 85-47	D	ND	F	A	E	G	C	ND	B	E	F	F	A	ND	E	E	E	E	ND	F
R- 21	RAH- 84-47	D	ND	F	A	E	G	C	ND	B	E	F	F	A	ND	E	E	E	E	ND	F
R- 20	RAH- 83-47	D	ND	F	A	E	G	C	ND	B	E	F	F	A	ND	E	E	E	E	E	F
R- 19	RAH- 82-47	D	ND	F	A	E	G	C	ND	A	E	F	F	B	ND	E	F	E	E	ND	E
R- 18	RAH- 81-47	D	ND	F	A	E	G	C	ND	A	E	F	F	C	ND	E	E	E	E	E	F
R- 17	RAH- 80-47	C	ND	F	A	E	G	C	ND	A	E	F	F	A	ND	E	E	E	E	ND	E
R- 16	RAH- 79-47	C	ND	F	A	E	E	C	ND	B	E	F	F	A	ND	E	E	E	E	E	E
R- 15	RAH- 78-47	C	ND	F	A	E	G	B	ND	B	E	F	F	A	ND	E	F	E	E	ND	E
R- 14	RAH- 77-47	C	ND	F	A	F	G	C	ND	B	E	F	E	A	ND	E	E	E	E	ND	E
R- 13	RAH- 76-47	C	E	F	A	F	G	C	ND	B	E	F	E	A	G	E	E	E	E	ND	E
R- 12	RAH- 75-47	C	ND	F	A	E	G	C	ND	B	E	F	F	A	ND	E	E	D	E	ND	E
R- 11	RAH- 74-47	C	E	E	B	F	G	C	ND	C	E	F	E	A	ND	E	E	D	E	ND	E

R- 10	RAH- 73-47	C	E	F	A	E	G	C	ND	C	E	F	F	A	ND	E	E	E	E	E	E
R- 9	RAH- 72-47	C	ND	F	A	E	G	C	ND	C	E	F	E	A	ND	E	E	E	D	ND	E
R- 8	RAH- 71-47	D	ND	F	A	E	G	C	ND	C	E	F	E	A	ND	E	F	E	E	ND	E
R- 7	RAH- 70-47	C	ND	F	B	E	G	C	ND	C	E	F	E	A	ND	E	F	E	E	ND	E
R- 6	RAH- 69-47	C	E	F	A	F	G	B	ND	C	E	F	E	A	ND	E	ND	E	E	ND	E
R- 5	RAH- 68-47	C	E	F	B	F	G	B	ND	C	E	F	F	A	ND	E	E	E	F	ND	E
R- 4	RAH- 67-47	C	E	F	A	F	G	C	ND	C	E	F	E	A	ND	E	ND	E	E	ND	E
	Bed R-3 not analyzed.																				
R- 2	RAH- 65-47	C	E	F	A	E	G	C	ND	C	E	F	E	A	G	E	E	E	E	ND	E
R- 1	RAH- 64-47	C	E	F	A	E	G	C	ND	C	E	F	E	A	F	E	E	E	E	ND	E
P-140	LES- 148-47	C	ND	F	A	E	G	C	ND	C	E	E	F	A	G	E	E	E	E	ND	E
P-139	LES- 147-47	C	ND	F	B	F	G	C	ND	C	E	ND	F	A	ND	E	ND	E	E	ND	E
P-138	LES- 146-47	C	ND	E	A	E	G	C	ND	B	E	F	E	A	G	D	F	E	E	ND	E
P-137	LES- 145-47	B	ND	E	B	E	G	C	ND	C	E	F	E	A	G	D	F	E	E	ND	E
P-136	LES- 144-47	C	ND	F	B	E	G	C	ND	C	E	ND	F	A	ND	D	ND	E	E	ND	F
P-135	LES- 140-47	C	ND	E	C	F	G	C	ND	C	E	ND	F	A	ND	D	ND	E	E	ND	E
P-134	LES- 139-47	C	ND	E	C	F	G	C	ND	C	E	ND	F	A	ND	D	ND	E	E	ND	E
P-133	LES- 138-47	C	ND	E	C	F	G	C	ND	C	E	ND	F	A	ND	D	ND	E	E	ND	E
P-132	LES- 137-47	C	ND	E	C	E	G	C	ND	D	E	F	E	A	ND	D	F	E	E	ND	E
P-131	LES- 136-47	C	ND	E	C	E	G	C	ND	C	E	F	E	A	ND	D	F	E	E	ND	E
P-130	LES- 135-47	C	E	E	A	E	G	C	ND	C	E	F	E	A	ND	D	ND	D	E	ND	E
P-129	LES- 134-47	C	ND	E	B	E	G	C	ND	C	E	F	E	A	ND	D	F	E	E	ND	E
P-128	LES- 133-47	B	E	E	B	E	G	C	ND	C	E	F	E	A	G	D	E	D	E	E	E
P-127	LES- 143-47	D	ND	F	A	E	G	C	ND	D	E	F	E	A	G	D	E	E	E	ND	E
P-126	LES- 142-47	C	ND	F	A	E	G	C	ND	C	E	F	F	A	G	D	E	E	D	ND	E
P-125	LES- 141-47	C	ND	F	A	F	G	C	ND	C	E	ND	E	A	ND	D	ND	E	D	ND	E
P-124	RAH- 111-47	D	ND	F	A	E	G	D	ND	D	E	F	E	C	G	D	E	E	D	E	E
P-123	RAH- 110-47	D	E	F	A	E	G	C	ND	D	E	F	F	C	G	D	D	E	D	E	E
P-122	RAH- 109-47	C	E	E	A	E	G	C	ND	C	E	F	E	A	F	D	E	D	E	E	E
P-121	RAH- 108-47	D	ND	F	A	E	G	C	ND	D	E	F	E	C	G	D	E	E	D	ND	E
P-120	RAH 107-47	C	ND	F	A	D	G	C	ND	D	F	E	E	B	F	D	D	E	D	D	E
P-119	RAH- 106-47	C	ND	F	A	D	G	C	ND	D	E	F	E	B	G	D	D	E	D	E	E
P-118	RAH- 105-47	C	E	F	A	D	G	C	E	D	E	F	E	B	F	D	D	E	D	D	E
P-117	RAH- 104-47	C	ND	F	A	E	G	C	ND	D	F	F	E	A	G	D	E	E	D	E	E
P-116	RAH- 103-47	C	ND	F	A	E	G	C	ND	C	E	F	E	A	G	D	F	E	E	E	E
P-115	RAH- 102-47	C	E	F	A	D	G	C	ND	D	E	E	E	A	G	D	D	E	E	E	E
P-114	RAH- 101-47	C	D	F	A	D	G	C	E	D	E	F	E	A	G	D	D	E	E	E	E
P-113	RAH- 100-47	C	E	E	C	E	G	C	E	D	E	F	E	A	G	E	E	E	E	E	E
P-112	VEM-174-47	D	E	F	B	ND	G	C	E	C	E	F	F	A	ND	E	E	E	E	ND	E
P-111	VEM-173-47	C	ND	E	C	E	G	C	ND	D	E	F	F	A	G	E	E	E	E	ND	F
P-110	LES- 179-47	D	E	F	A	E	G	C	ND	B	E	F	F	A	G	E	E	E	E	ND	E
P-109	LES- 178-47	C	E	F	A	E	G	C	ND	D	E	F	E	B	G	D	D	E	E	E	E
P-108	LES- 177-47	C	ND	F	B	E	G	C	ND	C	E	ND	E	A	ND	D	ND	E	E	ND	E
P-107	LES- 176-47	C	ND	F	A	E	G	C	ND	C	E	F	E	A	ND	D	F	E	E	ND	E

Bed no.	Sample no.	Al	Ba	B	Ca	Cr	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Si	Ag	Na	Sr	Ti	V	Zn	Zr
P-106	LES- 175-47	C	D	E	A	D	G	C	E	D	E	F	E	A	G	D	D	D	E	ND	E
P-105	LES- 174-47	C	ND	E	C	E	G	C	ND	D	E	ND	F	A	ND	D	ND	D	E	ND	E
P-104	LES- 173-47	B	E	E	C	E	G	C	ND	D	E	F	E	A	G	D	E	D	E	ND	E
P-103	LES- 172-47	C	ND	E	A	D	G	C	ND	D	E	E	E	A	G	D	E	E	D	D	E
P-102	LES- 171-47	C	E	E	B	C	G	C	ND	C	E	E	D	A	F	D	E	D	D	D	E
P-101	LES- 170-47	C	ND	E	A	E	G	C	ND	C	E	E	E	A	G	D	F	D	E	ND	E
P-100	LES- 169-47	C	ND	E	A	D	G	C	ND	D	E	E	E	A	G	C	E	E	D	E	E
P- 99	LES- 168-47	C	E	E	B	E	G	C	ND	C	E	E	E	A	G	C	E	E	E	ND	E
P- 98	LES- 167-47	C	ND	F	B	E	G	C	ND	D	F	ND	F	A	ND	C	ND	E	E	ND	F
P- 97	LES- 166-47	C	ND	F	A	D	G	C	ND	D	F	E	E	A	G	C	E	E	D	E	E
P- 96	LES- 165-47	C	ND	F	A	D	G	C	ND	D	F	F	E	B	G	C	E	E	E	E	E
P- 95	LES- 164-47	C	ND	F	A	D	G	C	ND	D	F	F	E	B	G	D	F	E	E	E	E
P- 94	LES- 163-47	C	ND	E	A	D	G	C	ND	D	E	F	E	A	G	D	F	D	E	E	E
P- 93	LES- 162-47	B	ND	E	A	D	G	C	ND	C	E	E	E	A	G	D	E	D	E	E	E
P- 92	LES- 161-47	C	ND	F	A	E	G	C	ND	C	E	F	F	C	ND	E	ND	D	E	E	F
P- 91	LES- 160-47	B	E	E	C	D	G	C	ND	D	E	E	D	A	G	D	E	E	D	E	E
P- 90	LES- 159-47	B	E	E	D	D	G	C	ND	D	E	E	D	A	F	D	E	D	D	E	E
P- 89	LES- 158-47	B	E	E	D	E	G	C	ND	D	E	E	D	A	F	D	E	D	D	E	E
P- 88	LES- 157-47	B	ND	E	D	E	G	C	ND	C	E	E	E	A	G	D	E	D	D	E	E
P- 87	LES- 156-47	B	ND	E	G	D	G	C	ND	D	E	E	E	A	G	D	E	D	D	E	E
P- 86	LES- 155-47	B	E	E	A	D	G	C	ND	D	E	E	E	A	G	D	E	E	D	E	E
P- 85	LES- 154-47	B	E	E	A	E	G	C	ND	D	E	F	E	A	G	D	E	D	E	ND	E
P- 84	LES- 153-47	C	ND	F	A	E	G	C	ND	B	E	F	F	A	G	D	F	E	E	ND	E
P- 83	LES- 152-47	C	ND	E	B	E	G	C	ND	D	E	F	E	A	G	D	F	E	D	ND	E
P- 82	LES- 151-47	B	ND	E	C	E	G	C	ND	C	E	F	E	A	G	D	E	D	E	ND	E
P- 81	LES- 150-47	C	ND	E	B	E	G	C	ND	D	E	F	E	A	G	D	F	D	E	ND	E
P- 80	LES- 149-47	C	ND	E	A	D	G	C	ND	D	E	F	E	A	G	D	F	D	E	ND	E
P- 79	VEM-172-47	C	ND	F	A	E	G	C	ND	C	E	F	F	A	G	D	F	E	E	ND	F
P- 78	VEM-171-47	C	E	E	B	E	G	C	ND	C	E	F	E	A	G	D	E	D	E	ND	E
P- 77	VEM-169-47	C	E	E	A	E	G	C	ND	D	E	F	E	A	G	D	E	D	E	E	E
--	VEM-170-47	D	ND	F	A	E	G	D	ND	D	F	F	F	C	G	E	E	E	E	ND	F
P- 76	VEM-168-47	C	ND	F	A	D	G	C	ND	D	E	F	E	A	G	D	E	E	E	E	E
P- 75	VEM-167-47	C	E	E	A	D	G	C	ND	D	E	E	E	A	F	D	D	E	D	E	E
P- 74	VEM-166-47	D	ND	F	A	E	G	D	ND	C	E	F	E	C	G	E	E	E	E	ND	E
P- 73	VEM-165-47	C	ND	F	A	E	G	C	ND	D	F	E	E	A	G	D	E	E	D	E	E
P- 72	VEM-164-47	C	ND	F	A	E	G	C	ND	C	E	E	E	A	G	D	F	E	E	ND	E
P- 71	VEM-163-47	C	ND	E	A	E	G	C	ND	D	E	F	E	A	G	D	E	E	E	E	E
P- 70	VEM-162-47	C	ND	F	A	D	G	C	ND	D	E	E	E	A	G	D	E	E	D	E	E
P- 69	VEM-161-47	C	ND	F	A	E	G	C	ND	D	F	F	F	C	G	E	E	E	E	E	E
P- 68	VEM-160-47	C	E	F	A	E	G	D	ND	C	E	F	E	C	G	D	E	E	E	ND	E
P- 67	VEM-159-47	C	ND	E	A	E	G	C	ND	D	F	F	E	A	G	D	E	E	E	ND	F
P- 66	VEM-158-47	C	ND	E	A	E	G	C	ND	D	E	F	E	A	G	D	E	E	E	E	E

P- 65	VEM-157-47	C	ND	F	A	E	G	C	ND	C	F	F	E	B	G	D	ND	E	E	ND	F
P- 64	VEM-156-47	C	ND	F	A	E	G	C	ND	D	F	F	E	A	G	D	E	E	E	E	F
P- 63	VEM-155-47	C	ND	F	A	E	G	C	ND	D	E	E	E	B	G	D	E	E	E	E	E
P- 62	VEM-154-47	D	ND	F	A	E	G	D	ND	C	F	F	E	C	ND	E	E	E	E	ND	F
P- 61	VEM-153-47	D	ND	F	A	E	G	D	ND	D	F	F	E	C	G	D	E	E	E	E	F
P- 60	VEM-152-47	C	ND	F	A	E	G	D	ND	D	F	F	F	B	G	D	E	E	E	ND	F
P- 59	VEM-151-47	C	ND	F	A	E	G	D	ND	C	F	F	F	A	G	D	E	E	E	ND	F
P- 58	VEM-150-47	C	ND	E	A	E	G	C	ND	C	E	F	E	A	G	D	F	E	E	ND	E
P- 57	VEM-149-47	C	ND	E	A	E	G	C	ND	C	E	F	E	A	G	D	F	E	E	ND	E
P- 56	VEM-148-47	C	ND	E	B	E	G	C	ND	C	F	ND	E	A	ND	D	E	E	E	ND	E
P- 55	VEM-147-47	C	ND	F	A	E	G	C	ND	C	F	ND	E	A	ND	E	E	E	E	ND	F
P- 54	VEM-146-47	C	ND	F	C	E	G	C	ND	D	F	ND	F	A	ND	E	E	E	E	ND	F
P- 53	VEM-145-47	D	ND	F	A	E	G	C	ND	C	F	F	E	B	G	E	F	E	E	ND	E
P- 52	VEM-123-47	C	ND	F	B	E	G	C	ND	C	E	F	E	A	ND	E	F	E	E	ND	E
P- 51	VEM-122-47	D	ND	F	A	E	G	D	ND	C	F	F	F	A	G	E	F	E	E	ND	E
P- 50	VEM-121-47	C	ND	E	A	E	G	C	ND	D	E	F	E	A	G	E	F	E	E	E	F
P- 49	VEM-120-47	C	ND	F	A	E	G	C	ND	C	E	F	F	A	G	E	F	E	E	ND	E
P- 48	VEM 119-47	C	ND	F	A	E	G	C	ND	C	E	F	E	A	G	D	F	E	E	ND	F
P- 47	VEM 118-47	C	E	F	A	E	G	C	ND	C	E	F	E	A	G	D	E	E	E	E	E
P- 46	VEM-117-47	C	ND	E	B	E	G	C	ND	D	E	F	E	A	G	E	F	D	D	E	E
P- 45	VEM-116-47	C	ND	F	A	E	G	D	ND	D	F	F	E	A	G	D	F	E	D	E	F
P- 44	VEM-114-47	C	ND	E	A	E	G	C	ND	C	E	E	E	A	G	D	E	E	D	D	E
--	VEM-115-47	C	ND	ND	A	ND	G	D	ND	D	E	F	E	B	ND	E	ND	E	E	ND	F
P- 43	VEM-113-47	C	ND	F	A	ND	G	D	ND	D	E	F	E	A	ND	D	ND	E	E	ND	F
P- 42	VEM-112-47	C	ND	E	A	E	G	C	ND	D	E	E	E	A	G	D	E	E	D	E	E
--	VEM-111-47	D	E	F	A	E	G	D	ND	D	E	F	E	B	G	D	E	E	E	ND	E
P- 41	VEM-110-47	C	ND	E	A	E	G	C	ND	D	E	E	E	A	G	D	E	D	D	E	E
P- 40	VEM-108-47	C	ND	F	C	E	G	C	ND	D	E	F	E	A	ND	D	E	D	D	E	F
--	VEM-109-47	D	ND	F	A	E	G	C	ND	D	E	F	F	B	ND	E	E	E	E	ND	F
P- 39	VEM-107-47	C	ND	F	C	E	G	C	ND	C	E	F	F	A	ND	D	E	D	E	ND	F
P- 38	VEM-106-47	C	ND	F	B	E	G	C	ND	D	E	F	F	B	ND	D	E	E	D	E	F
P- 37	VEM-105-47	D	ND	F	A	E	G	D	ND	D	E	ND	F	B	ND	E	ND	E	E	ND	F
P- 36	LES- 132-47	C	ND	F	A	E	G	C	ND	D	F	ND	E	A	G	D	ND	E	D	ND	F
P- 35	LES- 131-47	C	ND	F	A	E	G	D	ND	D	E	F	E	A	G	D	E	E	D	E	E
P- 34	LES- 130-47	C	ND	F	A	E	G	C	ND	D	E	F	E	A	G	E	F	E	E	E	E
P- 33	LES- 129-47	C	ND	F	A	E	G	C	ND	C	F	F	E	A	G	D	E	E	E	E	E
P- 32	LES- 128-47	D	ND	F	A	E	G	D	ND	C	E	F	E	B	G	E	F	E	E	ND	E
P- 31	LES- 127-47	C	ND	F	A	E	G	C	ND	D	E	F	E	A	G	D	F	E	E	ND	E
P- 30	LES- 126-47	C	ND	E	A	D	G	C	ND	C	E	F	E	A	G	D	D	D	E	D	E
P- 29	LES- 125-47	C	ND	F	A	E	G	C	ND	C	E	F	E	A	G	E	F	E	E	ND	E
P- 28	LES- 124-47	C	ND	E	A	E	G	C	ND	D	E	F	E	A	G	C	E	E	E	E	E
P- 27	LES- 123-47	D	ND	F	A	ND	G	C	ND	C	F	ND	F	A	G	E	ND	E	E	ND	F
P- 26	LES- 122-47	D	ND	F	A	E	G	D	ND	D	E	F	F	B	G	E	F	E	E	ND	E
P- 25	LES- 121-47	C	ND	E	A	E	G	C	ND	C	E	F	E	A	G	D	F	E	E	ND	E
P- 24	LES- 120-47	C	ND	F	A	E	G	C	ND	D	E	F	E	A	ND	E	F	E	E	ND	E

Bed no.	Sample no.	Al	Ba	B	Ca	Cr	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Si	Ag	Na	Sr	Ti	V	Zn	Zr
P- 23	LES- 119-47	D	ND	F	A	ND	G	D	ND	D	F	ND	F	A	G	E	F	E	E	ND	F
P- 22	LES- 118-47	D	E	F	A	E	G	D	ND	D	E	F	E	C	G	E	E	E	E	ND	E
P- 21	LES- 117-47	D	ND	F	A	ND	G	D	ND	D	F	ND	F	C	G	E	ND	E	E	ND	F
P- 20	VEM-144-47	D	E	F	A	F	G	D	ND	D	E	F	F	C	G	E	E	E	E	ND	E
P- 19	VEM-143-47	C	ND	F	A	E	G	D	ND	C	F	ND	F	A	ND	E	E	E	E	ND	F
P- 18	VEM-142-47	D	E	F	A	E	G	C	ND	D	E	F	E	B	G	D	E	E	E	ND	E
P- 17	VEM-141-47	D	ND	F	A	ND	G	D	ND	C	F	ND	F	B	ND	E	ND	E	E	ND	F
P- 16	VEM-140-47	C	ND	F	A	E	G	D	ND	C	F	ND	F	A	ND	E	ND	E	E	ND	F
P- 15	VEM-139-47	C	ND	F	A	E	G	C	ND	B	E	F	E	A	G	E	F	E	E	ND	E
P- 14	VEM-138-47	C	ND	F	A	E	G	C	ND	B	E	F	F	A	G	D	E	E	E	ND	F
P- 13	VEM-137-47	D	ND	F	A	E	G	C	ND	C	E	F	F	B	G	E	E	E	E	E	E
P- 12	VEM-136-47	C	E	F	A	E	G	C	ND	C	E	F	E	A	G	E	E	E	E	ND	E
P- 11	VEM-135-47	C	E	F	A	E	G	C	ND	C	E	F	E	A	G	E	E	E	E	ND	E
P- 10	VEM-134-47	C	ND	F	A	E	G	C	ND	C	E	F	F	A	ND	E	F	E	E	ND	F
P- 9	VEM-133-47	C	ND	F	A	F	G	C	ND	C	E	ND	E	A	ND	E	ND	E	E	ND	F
P- 8	VEM-132-47	C	ND	F	A	D	G	D	ND	C	E	E	E	B	G	D	E	E	D	E	E
P- 7	VEM-131-47	C	E	F	A	E	G	C	ND	C	E	E	E	A	F	D	E	E	D	E	E
P- 6	VEM-130-47	C	ND	F	A	E	G	C	ND	D	E	E	E	B	G	D	D	E	D	E	F
P- 5	VEM-129-47	C	E	E	B	E	G	C	ND	C	E	E	E	A	G	E	E	D	D	E	E
P- 4	VEM-128-47	C	ND	E	C	F	G	C	ND	C	E	F	E	A	ND	E	F	E	E	ND	E
P- 3	VEM-127-47	C	ND	E	C	E	G	C	ND	C	E	E	E	A	G	E	E	D	D	E	E
P- 2	VEM-126-47	C	ND	E	A	E	G	C	E	C	E	F	E	A	G	E	E	D	E	E	E
P- 1	VEM-125-47	D	ND	F	A	E	G	C	D	D	E	F	E	C	G	D	E	E	E	ND	E
Cw - 1	VEM-124-47	D	ND	F	A	E	F	C	ND	B	E	F	E	B	G	E	F	E	E	E	E

UPPER BRAZER CANYON, UTAH. LOT NO. 1228.

Phosphatic shale member of Phosphoria formation sampled in bulldozer trench on north side of Upper Brazer Canyon, sec. 30, T. 11 N., R. 8 E., Rich County, Utah, on east limb of syncline. Beds strike N. 36° E. and dip 39° W. Section measured by V. E. McKelvey, J. E. Smedley, R. A. Hoppin, and F. W. O' Malley and sampled by R. G. Waring, J. A. Noel, and R. P. Sheldon in June and July 1948. Samples analyzed for P_2O_5 and acid insoluble by U. S. Bureau of Mines Laboratory, Albany, Oregon, and for other constituents by Trace Elements Section Laboratory, U. S. Geological Survey, Washington, D. C.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
	Phosphatic shale member of Phosphoria formation—top not exposed									
P-84	Limestone, argillaceous	JES - 1089	5.0	0.8	--	--	--	45.5	5.0	4.00
P-83	Mudstone, calcareous	JES - 1088	1.1	0.8	--	--	--	62.1	6.1	4.88
P-82	Phosphate rock, argillaceous	JES - 1087	1.2	21.0	4.2	2.04	2.82	38.1	7.3	30.08
P-81	Limestone, argillaceous; fos. col. no. 48-JES-48[1]	JES - 1086	2.8	6.2	4.1	2.29	23.90	30.5	10.1	47.44
P-80	Phosphate rock	JES - 1085	0.8	30.8	1.6	0.63	6.48	6.1	10.9	72.08
P-79	Phosphate rock	JES - 1084	2.0	32.4	0.73	0.30	6.54	2.8	12.9	136.88
P-78	Phosphate rock	RAH- 1094	1.9	32.1	0.89	0.59	5.44	2.5	14.8	197.87
P-77	Phosphate rock, argillaceous	RAH- 1093	0.5	20.7	2.7	1.07	8.10	26.4	15.3	208.22
P-76	Phosphate rock	RAH- 1092	1.1	33.6	1.0	0.34	4.10	2.8	16.4	245.18
P-75	Phosphate rock	RAH- 1091	0.5	33.2	1.2	0.39	4.86	4.3	16.9	261.78
P-74	Phosphate rock, calcareous	RAH- 1080	3.0	23.9	2.7	1.14	7.26	18.2	19.9	333.48
P-73	Limestone, argillaceous	RAH- 1079	2.3	0.9	3.4	1.64	27.92	38.3	22.2	335.55
P-72	Phosphate rock, argillaceous	RAH- 1078	0.7	25.3	4.8	1.45	5.08	21.3	22.9	353.26
P-71	Phosphate rock, argillaceous	RAH- 1077	1.4	20.6	2.8	1.69	5.72	34.1	24.3	382.10
P-70	Phosphate rock, argillaceous; fos. col. no. 48-JES-47	RAH- 1076	2.8	25.6	2.6	1.68	3.58	25.5	27.1	453.78
P-69	Limestone, argillaceous	WOM-1083	2.2	3.1	--	--	--	34.4	29.3	460.60
P-68	Chert	WOM-1082	2.7	1.8	--	--	--	92.6	32.0	465.46
P-67	Mudstone, calcareous	WOM-1081	3.7	2.1	--	--	--	52.7	35.7	473.23
P-66	Phosphate rock, argillaceous; fos. col. no. 48-JES-46	WOM-1070	1.4	24.9	--	--	--	24.2	37.1	508.09
P-65	Mudstone and calcareous phosphate rock; fos. col. no. 48-JES-45	WOM-1069	3.0	3.3	--	--	--	53.3	40.1	517.99
P-64	Mudstone; fos. col. no. 48-JES-44	WOM-1068	1.6	1.9	--	--	--	62.8	41.7	521.03
P-63	Limestone, argillaceous	WOM-1067	2.2	5.5	--	--	--	42.2	43.9	533.13
P-62	Phosphate rock, argillaceous, calcareous	WOM-1066	1.6	17.1	--	--	--	28.7	45.5	560.49
P-61	Limestone and mudstone; fos. col. no. 48-JES-41	RAH- 1075	2.25	1.0	--	--	--	16.0	47.75	562.99
P-60	Mudstone	RAH- 1074	0.5	0.3	--	--	--	69.5	48.25	563.14

[1] Fossil collection made by J. E. Smedley, Paleontology and Stratigraphy Branch, U. S. Geological Survey.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
P-59	Mudstone	RAH- 1073	0.9	1.9	--	--	--	74.5	49.15	564.85
P-58	Mudstone; fos. col. no. 48-JES-40	RAH- 1072	0.6	7.7	--	--	--	58.3	49.75	569.47
P-57	Limestone, argillaceous; fos. col. nos. 48-JES-42 and 48-JES-43	RAH- 1071	1.8	1.1	--	--	--	35.3	51.55	571.45
--	Limestone, argillaceous; fos. col. no. 48-JES-39	RAH- 1050	(1.8)	0.8	--	--	--	32.8	--	--
	RAH-1050 represents the same bed as RAH-1071 but was collected 20 feet farther west.									
P-56	Mudstone and phosphate rock	RAH- 1049	1.6	7.8	--	--	--	62.3	53.15	583.93
P-55	Mudstone and calcareous mudstone	VEM- 1010	3.4	1.5	--	--	--	74.0	56.55	589.03
P-54	Mudstone, phosphatic	VEM- 1009	2.5	10.1	--	--	--	44.9	59.05	614.28
P-53	Limestone, argillaceous; fos. col. no. 48-JES-38	VEM- 1008	0.7	1.6	--	--	--	30.1	59.75	615.40
P-52	Limestone, phosphatic mudstone, and calcareous mudstone	VEM- 1007	1.4	6.3	--	--	--	50.3	61.15	624.22
P-51	Mudstone, calcareous, phosphatic	VEM- 1006	0.6	11.5	--	--	--	35.1	61.75	631.12
P-50	Limestone; fos. col. no. 48-JES-37	VEM- 1005	0.7	6.4	--	--	--	9.9	62.45	635.60
P-49	Limestone, argillaceous	VEM- 1060	0.9	1.3	--	--	--	26.1	63.35	636.77
P-48	Mudstone, phosphatic	VEM- 1059	1.5	13.1	--	--	--	34.6	64.85	656.42
P-47	Limestone	VEM- 1058	1.3	6.4	--	--	--	19.7	66.15	664.74
P-46	Mudstone and calcareous phosphate rock; fos. col. no. 48-JES-36	WOM-1065	2.5	21.1	--	--	--	15.7	68.65	717.49
P-45	Limestone	WOM-1064	0.9	3.7	--	--	--	16.0	69.55	720.82
P-44	Phosphate rock, calcareous	WOM-1063	2.6	27.0	--	--	--	8.9	72.15	791.02
P-43	Limestone, phosphatic	WOM-1062	1.9	13.8	--	--	--	10.0	74.05	817.24
--	Phosphate rock, calcareous	RPS - 1004	(1.9)	16.8	--	--	--	14.9	--	--
	RPS-1004 represents the same bed as WOM-1062.									
P-42	Phosphate rock, argillaceous	WOM-1061	1.2	15.5	--	--	--	37.7	75.25	835.84
--	Mudstone, phosphatic	RPS - 1003	(1.0)	13.1	--	--	--	43.1	--	--
	RPS-1003 represents the same bed as WOM-1061.									
P-41	Mudstone	WOM-1030	1.0	7.0	--	--	--	56.7	76.25	842.84
--	Mudstone	RAH- 1015	(1.0)	5.6	--	--	--	59.4	--	--
	RAH-1015 represents the same bed as WOM-1030.									
P-40	Mudstone, calcareous	RAH- 1014	6.5	2.9	--	--	--	57.9	82.75	861.69
--	Mudstone, calcareous; fos. col. no. 48-JES-35	WOM-1029	(1.3)	6.4	--	--	--	55.7	--	--
	WOM-1029 represents the top 1.3 feet of RAH-1014.									

P-39	Mudstone, calcareous; fos. col. no. 48-JES-34	RAH- 1013	1.8	3.9	--	--	--	53.7	84.55	868.71
P-38	Limestone, argillaceous	RAH- 1012	0.9	0.9	--	--	--	21.4	85.45	869.52
P-37	Mudstone and limestone	RAH- 1011	1.5	2.8	--	--	--	46.8	86.95	873.72
P-36	Mudstone	RPS- 1002	2.2	5.3	--	--	--	64.9	89.15	885.38
P-35	Limestone and mudstone	RPS- 1001	2.7	1.5	--	--	--	21.4	91.85	889.43
P-34	Mudstone, calcareous	RPS- 1829	1.7	2.9	--	--	--	60.5	93.55	894.36
P-33	Chert and limestone	RAH- 1048	0.7	3.9	--	--	--	72.3	94.25	897.09
P-32	Mudstone and limestone	RAH- 1074	2.9	1.3	--	--	--	34.5	97.15	900.86
P-31	Mudstone, cherty, calcareous	RAH- 1046	2.8	4.4	--	--	--	68.4	99.95	913.18
P-30	Limestone, cherty	RAH- 1045	3.9	1.4	--	--	--	26.4	103.85	918.64
P-29	Mudstone	RAH- 1044	3.1	7.0	--	--	--	59.2	106.95	940.34
P-28	Chert and phosphatic mudstone	RAH- 1043	1.1	12.9	--	--	--	49.5	108.05	954.53
P-27	Limestone and cherty limestone	RAH- 1041	1.6	2.7	--	--	--	70.0	109.65	958.85
--	Limestone concretion in RAH-1041	RAH- 1042	(0.0-3.0)	0.6	--	--	--	18.2	--	--
P-26	Phosphate rock, argillaceous; fos. col. no. 48-JES-33	RAH- 1020	0.8	17.5	--	--	--	40.9	110.45	972.85
P-25	Mudstone and argillaceous phosphate rock	RAH- 1019	1.2	16.2	--	--	--	44.6	111.65	992.29
P-24	Limestone, argillaceous; fos. col. no. 48-JES-32	RAH 1018	1.9	0.9	--	--	--	37.8	113.55	994.00
P-23	Mudstone	RAH- 1017	0.5	7.2	--	--	--	67.3	114.05	997.60
P-22	Phosphate rock and mudstone	RAH- 1016	0.9	18.6	--	--	--	39.2	114.95	1,014.34
P-21	Mudstone, phosphatic	WOM-1028	1.6	10.9	--	--	--	61.7	116.55	1,031.78
P-20	Mudstone, calcareous	WOM-1027	1.5	2.7	--	--	--	56.5	118.05	1,035.83
P-19	Phosphate rock, argillaceous	WOM-1026	1.3	27.6	--	--	--	21.3	119.35	1,071.71
P-18	Phosphate rock and limestone, argillaceous; fos. col. no. 48-JES-31	WOM-1025	3.7	20.2	--	--	--	22.4	123.05	1,146.45
P-17	Phosphate rock and limestone, argillaceous	WOM-1024	2.2	18.4	--	--	--	39.4	125.25	1,186.93
P-16	Mudstone, calcareous and limestone	WOM-1023	1.8	3.3	--	--	--	25.3	127.05	1,192.87
P-15	Mudstone, phosphatic; fos. col. no. 48-JES-30	WOM-1022	2.1	12.0	--	--	--	50.5	129.15	1,218.07
P-14	Chert	VEM- 1053	0.4	5.0	--	--	--	68.6	129.55	1,220.07
P-13	Limestone, argillaceous	VEM- 1052	0.8	1.8	--	--	--	33.8	130.35	1,221.51
--	Phosphate rock and chert; fos. col. no. 48-JES-29	WOM-1021	(1.0)	15.6	--	--	--	45.4	--	--
	WOM-1021 represents a composite of VEM-1052 and VEM-1053.									
P-12	Mudstone, calcareous	VEM- 1051	0.5	7.0	--	--	--	50.5	130.85	1,225.01
P-11	Limestone, argillaceous	VEM- 1040	0.8	2.2	--	--	--	21.1	131.65	1,226.77
P-10	Limestone, argillaceous; fos. col. no. 48-JES-28	VEM- 1039	1.2	4.5	--	--	--	35.8	132.85	1,232.17
P- 9	Phosphate rock, calcareous and limestone; fos. col. no. 48-JES-27	VEM- 1038	0.5	4.5	--	--	--	16.3	133.35	1,234.42
P- 8	Phosphate rock, calcareous	VEM- 1037	0.9	14.6	--	--	--	27.1	134.25	1,247.56
P- 7	Limestone, fos. col. no. 48-JES-26	VEM- 1036	1.0	1.7	--	--	--	18.8	135.25	1,249.26

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
P- 6	Mudstone, calcareous; fos. col. no. 48-JES-25	VEM-1035	0.8	4.6	--	--	--	45.5	136.05	1,252.94
P- 5	Limestone, argillaceous; fos. col. no. 48-JES-24	VEM-1034	1.4	2.5	--	--	--	23.6	137.45	1,256.44
P- 4	Mudstone, calcareous; fos. col. no. 48-JES-23	VEM-1033	0.8	3.7	--	--	--	48.8	138.25	1,259.40
P- 3	Limestone, argillaceous	VEM-1032	0.5	4.4	--	--	--	42.2	138.75	1,261.60
P- 2	Limestone, argillaceous	VEM-1031	1.5	2.0	--	--	--	41.1	140.25	1,264.60
P- 1	Limestone, argillaceous	VEM-1057	1.4	3.0	--	--	--	30.5	141.65	1,268.80
	The contact between the Wells and Phosphoria formations is indistinct. VEM-1057 is believed to be below VEM-1031, though brecciation makes this uncertain. Since VEM-1057 is the lowest dark-colored bed exposed in the trench, it is taken as the base of the Phosphoria. However, about 75 feet east and probably 50 feet or more lower stratigraphically is an outcrop of black limestone typical in appearance of Phosphoria.									
	Wells formation									
Cw-4	Mudstone, calcareous	VEM-1056	0.9	3.7	--	--	--	50.9	0.9	3.33
Cw-3	Limestone, argillaceous	VEM-1055	2.0	3.4	--	--	--	42.0	2.9	10.13
Cw-2	Mudstone, calcareous	VEM-1054	1.9	3.8	--	--	--	53.4	4.8	17.35
Cw-1	Mudstone	--	--	--	--	--	--	--	--	--

WOLF CREEK, UTAH. LOT NO. 1231.

Park City formation sampled from a continuous exposure on south side of Wolf Creek, sec. 21, T. 1 N., R. 9 W., Wasatch County, Utah, on south flank of Uinta Range. Beds U-17, U-18, and W-1 sampled in small trench at base of Woodside formation on top of nose; beds U-12 to U-16 in hand trench on side of nose above cliff-making part of formation; beds U-6 to U-11 on cliff exposure; all other beds in hand trench on lower part of nose. Beds strike N. 82° W. and dip 12° S. Section measured by J. W. Huddle and J. B. Collins and sampled by R. S. Sears, G. F. Hosford, M. D. Stewart, and D. P. Sprouse in June and July 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
				Woodside shale						
W- 1	Mudstone, calcareous	JWH-2050	1.5	0.3	10.3	3.2	8.9	75.4	1.5	4.5
				Upper member of Park City formation						
U-18	Mudstone, calcareous	JWH-2049	1.8	<0.1	8.9	2.2	13.0	70.5	1.8	0.18
U-17	Sandstone, calcareous	JWH-2048	2.3	1.6	2.9	1.2	18.2	56.2	4.1	3.86
U-16	Chert and limestone	JWH-2047	5.6	0.6	1.3	2.3	9.2	76.2	9.7	7.22
U-15	Limestone, sandy	JWH-2046	5.1	0.2	1.4	2.0	25.4	42.7	14.8	8.24
U-14	Sandstone, calcareous, argillaceous	JWH-2045	4.4	0.4	6.4	2.1	10.2	75.2	19.2	10.00
U-13	Sandstone, calcareous	JWH-2044	0.8	1.2	3.1	3.5	3.7	74.9	20.0	10.96
U-12	Sandstone, calcareous	JWH-2043	7.0	0.5	4.6	2.2	11.8	71.6	27.0	14.46
U-11	Limestone, sandy	JWH-2040	1.0	0.7	0.51	1.6	27.2	39.2	28.0	15.16
U-10	Limestone, argillaceous	JWH-2039	12.3	0.7	0.6	2.4	23.4	45.8	40.3	23.77
U- 9	Limestone	JWH-2038	13.0	0.8	0.5	1.5	41.2	9.9	53.3	34.17
U- 8	Limestone	JWH-2037	17.7	0.4	0.7	0.7	44.6	4.6	71.0	41.25
U- 7	Limestone, argillaceous	JWH-2036	7.8	0.7	1.3	3.0	31.2	29.1	78.8	46.71
U- 6	Limestone	JWH-2035	18.0	5.7	0.8	1.1	44.1	4.5	96.8	149.31
U- 5	Limestone	JWH-2034	11.1	1.8	1.2	0.88	39.6	10.2	107.9	169.29
U- 4	Limestone, argillaceous	JWH-2033	8.4	2.2	1.4	1.6	32.9	23.2	116.3	187.77
U- 3	Limestone	JWH-2032	1.65	2.3	2.0	2.2	37.6	13.5	117.95	191.56
U- 2	Limestone, argillaceous and phosphate rock	JWH-2031	6.4	5.2	1.8	2.2	19.7	43.1	124.35	224.84
U- 1	Mudstone, calcareous	JWH-2030	1.5	7.3	2.1	2.5	9.5	57.8	125.85	235.80
				Phosphatic shale member of Park City formation						
P-37	Mudstone and phosphate rock, calcareous	JBC-2169	1.15	4.8	4.3	2.7	16.7	48.6	1.15	5.52
P-36	Phosphate rock, argillaceous	JBC-2168	0.6	22.0	3.2	0.9	8.4	22.3	1.75	18.72
P-35	Phosphate rock and calcareous mudstone	JBC-2167	1.1	12.3	5.2	2.0	12.6	37.0	2.85	32.25
P-34	Mudstone, calcareous	JBC-2166	2.2	3.6	7.5	1.8	14.3	57.8	5.05	40.17
P-33	Mudstone, calcareous	JBC-2165	4.2	2.3	8.0	2.5	14.9	58.5	9.25	49.83
P-32	Mudstone, calcareous	JBC-2164	1.35	1.6	7.8	2.9	11.0	69.2	10.60	51.99
P-31	Mudstone, calcareous	JBC-2163	2.7	3.2	3.4	2.8	8.2	71.5	13.30	60.63
P-30	Mudstone, calcareous, phosphatic	JBC-2162	1.15	8.5	8.8	2.9	12.0	46.6	14.45	70.40

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
P-29	Mudstone, calcareous	JBC-2161	1.2	2.7	10.5	2.6	16.7	55.6	15.65	73.64
P-28	Mudstone, calcareous	JWH-2029	2.7	4.1	6.8	2.5	12.6	57.5	18.35	84.72
P-27	Mudstone, calcareous	JWH-2028	4.6	2.1	6.7	2.4	18.5	49.5	22.95	94.38
P-26	Mudstone, calcareous	JWH-2027	1.1	3.6	5.3	2.0	12.4	60.4	24.05	98.34
P-25	Limestone, argillaceous	JWH-2026	0.7	0.7	2.8	2.3	24.9	42.2	24.75	98.82
P-24	Limestone, argillaceous	JWH-2025	2.8	1.7	6.5	2.2	22.3	45.8	27.55	103.58
P-23	Mudstone, calcareous	JWH-2024	2.75	2.3	9.2	3.6	18.6	51.6	30.30	109.91
P-22	Mudstone, calcareous	JWH-2023	1.8	3.8	7.6	3.4	16.3	54.3	32.10	116.75
P-21	Mudstone, calcareous	JWH-2022	2.1	3.6	10.6	3.5	16.5	55.6	34.20	124.31
P-20	Mudstone, calcareous	JWH-2021	2.2	2.9	11.0	3.5	17.5	52.9	36.40	130.69
P-19	Mudstone, calcareous	JWH-2020	0.95	6.9	11.7	4.1	10.7	52.1	37.35	137.24
P-18	Limestone, argillaceous	JWH-2019	1.1	1.7	4.0	2.1	32.9	25.6	38.45	139.12
P-17	Phosphate rock, argillaceous	JWH-2018	0.6	22.1	3.7	1.7	7.1	27.4	39.05	152.38
P-16	Mudstone, calcareous	JWH-2017	1.4	5.5	9.2	3.8	11.0	61.3	40.45	160.08
P-15	Mudstone, calcareous	JWH-2016	1.1	5.4	7.6	2.8	10.9	61.0	41.55	166.02
P-14	Mudstone	JWH-2015	2.55	5.1	4.6	2.6	12.6	65.0	44.10	179.02
P-13	Mudstone, calcareous	JWH-2014	1.4	1.6	4.2	2.1	17.4	57.9	45.50	181.26
P-12	Mudstone, calcareous	JWH-2013	2.1	2.3	6.2	2.3	15.8	58.6	47.60	186.09
P-11	Mudstone, calcareous	JWH-2012	3.1	3.8	8.4	2.7	16.1	53.9	50.70	197.87
P-10	Mudstone, calcareous, phosphatic	JWH-2011	2.25	8.3	11.6	3.8	12.8	51.3	52.95	216.54
P- 9	Mudstone, phosphatic, calcareous	JWH-2010	1.2	9.6	12.1	4.1	11.4	52.3	54.15	228.06
P- 8	Limestone and phosphatic mudstone	JWH-2009	2.2	6.3	3.8	1.5	31.8	18.0	56.35	241.92
P- 7	Limestone	JWH-2008	0.55	1.9	1.5	1.0	37.9	14.6	56.90	242.97
P- 6	Phosphate rock	JWH-2007	1.8	27.8	1.7	1.5	8.8	8.8	58.70	293.01
P- 5	Limestone, argillaceous, phosphatic	JWH-2006	0.95	9.5	1.7	1.4	23.7	24.8	59.65	302.04
P- 4	Limestone	JWH-2005	1.5	0.4	0.4	0.2	41.7	9.9	61.15	302.64
P- 3	Phosphate rock	JWH-2004	2.35	25.3	2.0	1.5	8.4	16.2	63.50	362.09
P- 2	Mudstone, calcareous, phosphatic	JWH-2003	0.5	10.1	1.6	2.7	13.9	40.3	64.00	367.14
P- 1	Limestone, argillaceous	JWH-2002	0.4	6.7	1.2	2.4	22.0	34.3	64.40	369.82
	Lower member of Park City formation									
L- 3	Limestone	JWH-2001	0.8	1.4	1.1	0.7	38.6	14.3	0.8	1.12
L- 2	Sandstone, calcareous, phosphatic	JWH-2041	5.2	7.8	0.8	1.4	20.9	57.8	6.0	37.00
L- 1	Sandstone	JWH-2042	6.2	0.6	0.9	1.3	7.9	79.8	12.2	40.72
	Weber formation—not measured									

SPECTROGRAPHIC ANALYSES—WOLF CREEK, UTAH. LOT NO. 1231.

Semi-quantitative analyses of samples of the Park City formation, Wolf Creek, Utah (see immediately preceding pages for location of section, thickness and description of strata, and chemical analyses of samples), made by U. S. Bureau of Mines Laboratory, Albany, Oregon. In addition to the elements listed in the table below, Sb, As, Ba, Be, Cd, Co, Cb, Ga, Ge, Au, In, Li, Hg, Pt, Ta, Sn, and W were looked for in all samples but were not detected.

Explanation of symbols

A = more than 10 percent
B = 5-10 percent
C = 1-5 percent
D = 0.1-1 percent
E = 0.01-0.1 percent
F = 0.001-0.01 percent
G = less than 0.001 percent
ND = not detected

Bed no.	Sample no.	Al	B	Ca	Cu	Cr	Fe	Pb	Mg	Mn	Mo	Ni	Si	Ag	Na	Sr	Ti	V	Zn	Zr
W- 1	JWH-2050	C	F	C	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E
U-18	JWH-2049	C	F	B	G	E	C	ND	C	E	F	F	A	ND	F	ND	E	E	ND	E
U-17	JWH-2048	C	F	A	G	E	C	ND	C	E	F	F	A	ND	F	ND	E	E	ND	E
U-16	JWH-2047	C	F	B	G	E	C	ND	C	E	F	F	A	ND	F	ND	E	E	ND	E
U-15	JWH-2046	C	F	A	G	E	C	ND	B	E	F	F	A	ND	F	ND	E	E	ND	E
U-14	JWH-2045	C	F	B	G	F	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E
U-13	JWH-2044	C	F	C	G	F	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E
U-12	JWH-2043	C	F	B	G	F	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E
U-11	JWH-2040	C	F	A	G	F	C	ND	B	E	F	F	A	ND	E	ND	E	E	ND	E
U-10	JWH-2039	C	F	A	G	F	C	ND	B	E	F	F	A	ND	E	ND	E	E	ND	E
U- 9	JWH-2038	C	F	A	G	F	C	ND	B	E	F	F	B	ND	E	ND	E	E	ND	E
U- 8	JWH-2037	C	F	A	G	F	C	ND	B	E	F	F	C	ND	E	ND	E	E	ND	E
U- 7	JWH-2036	C	F	A	G	E	C	ND	B	E	F	F	A	G	E	ND	E	E	ND	E
U- 6	JWH-2035	C	F	A	G	E	C	ND	B	E	F	F	C	ND	E	ND	E	E	ND	E
U- 5	JWH-2034	C	F	A	G	E	C	ND	B	E	F	F	B	ND	E	ND	E	E	ND	E
U- 4	JWH-2033	C	F	A	G	E	C	ND	B	E	F	F	A	ND	E	ND	E	E	ND	F
U- 3	JWH-2032	C	F	A	G	E	C	ND	B	E	F	F	B	ND	E	ND	E	E	ND	F
U- 2	JWH-2031	C	F	A	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	F
U- 1	JWH-2030	C	F	A	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	F
P-37	JBC-2169	C	F	A	G	E	C	E	C	E	F	F	A	G	E	ND	E	E	ND	F
P-36	JBC-2168	C	F	A	G	D	C	E	C	E	F	F	A	G	D	ND	E	E	ND	E
P-35	JBC-2167	C	F	A	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E
P-34	JBC-2166	C	F	A	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E
P-33	JBC-2165	C	F	C	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E
P-32	JBC-2164	C	F	C	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E
P-31	JBC-2163	C	F	A	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E
P-30	JBC-2162	C	F	A	G	D	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E
P-29	JBC-2161	C	F	B	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	E
P-28	JWH-2029	C	F	A	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	F

Bed no.	Sample no.	Al	B	Ca	Cu	Cr	Fe	Pb	Mg	Mn	Mo	Ni	Si	Ag	Na	Sr	Ti	V	Zn	Zr
P-27	JWH-2028	C	F	B	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	F
P-26	JWH-2027	C	F	A	G	E	C	ND	C	E	F	F	A	ND	E	ND	E	E	ND	F
P-25	JWH-2026	C	F	A	G	E	C	ND	C	E	F	F	A	G	E	ND	E	E	ND	F
P-24	JWH-2025	C	E	A	G	E	C	ND	B	E	E	E	A	G	E	ND	E	E	ND	F
P-23	JWH-2024	C	E	A	G	D	C	ND	C	E	E	E	A	G	E	ND	E	E	ND	F
P-22	JWH-2023	B	E	A	G	D	C	ND	C	E	E	E	A	G	E	ND	E	E	ND	F
P-21	JWH-2022	B	E	A	G	D	C	ND	C	E	E	E	A	G	E	ND	E	E	ND	F
P-20	JWH-2021	B	E	A	G	D	C	ND	C	E	F	E	A	G	D	F	E	E	ND	E
P-19	JWH-2020	C	E	A	G	D	C	ND	C	E	F	E	A	G	D	F	E	E	ND	E
P-18	JWH-2019	C	F	A	G	E	C	ND	B	E	F	E	A	G	E	F	E	E	ND	E
P-17	JWH-2018	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P-16	JWH-2017	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P-15	JWH-2016	C	F	B	G	E	C	ND	C	E	F	E	A	G	E	F	E	E	E	E
P-14	JWH-2015	C	F	B	G	E	C	ND	C	E	F	E	A	G	E	F	E	E	E	E
P-13	JWH-2014	C	F	B	G	E	C	ND	C	E	F	E	A	G	E	F	E	E	E	E
P-12	JWH-2013	C	F	B	G	E	C	ND	C	E	F	E	A	G	E	F	E	E	E	E
P-11	JWH-2012	C	F	B	G	E	C	ND	C	E	F	E	A	G	E	F	E	E	E	E
P-10	JWH-2011	B	E	A	G	D	C	E	C	E	F	E	A	G	D	F	E	E	E	E
P- 9	JWH-2010	B	E	A	G	D	C	E	C	E	F	E	A	G	D	F	E	E	E	E
P- 8	JWH-2009	C	F	A	G	E	C	E	B	E	F	E	A	G	E	F	E	E	E	E
P- 7	JWH-2008	C	F	A	G	E	C	ND	B	E	F	E	A	G	E	F	E	E	E	E
P- 6	JWH-2007	C	F	A	G	E	C	E	C	F	F	E	B	G	D	E	E	E	E	E
P- 5	JWH-2006	C	F	A	G	E	C	E	C	E	F	E	A	G	E	F	E	E	E	E
P- 4	JWH-2005	C	F	A	G	E	C	ND	B	E	F	E	B	G	E	F	E	E	E	E
P- 3	JWH-2004	C	F	A	G	E	C	ND	D	F	F	E	B	G	D	D	E	E	E	E
P- 2	JWH-2003	C	F	A	G	E	C	E	C	E	F	E	A	G	E	F	E	E	E	E
P- 1	JWH-2002	C	F	A	G	E	C	E	C	E	F	E	A	G	E	F	E	E	E	E
L- 3	JWH-2001	C	F	A	G	ND	C	ND	B	E	F	E	A	G	E	F	E	E	E	E
L- 2	JWH-2041	C	F	A	G	F	C	ND	B	E	F	F	A	ND	E	ND	E	E	ND	E
L- 1	JWH-2042	C	F	C	G	F	C	ND	C	E	F	F	A	ND	E	ND	E	F	ND	E

DRY CANYON, UTAH. LOT NO. 1229.

Phosphatic shale member of Park City formation sampled approximately 250 feet above stream bed on north side of Dry Canyon, S½SW¼ sec. 3, T. 1 N., R. 6 W., Duchesne County, Utah, on south flank of Uinta Range. Section measured by J. S. Huddle and sampled by G. F. Hosford, D. P. Sprouse, and M. D. Stewart in 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Upper member of Park City formation—lower part only						
U- 9	Limestone and cherty dolomite	--	12.0	--	--	12.0	--
U- 8	Dolomite and cherty limestone	--	7.2	--	--	19.2	--
U- 7	Dolomite and limestone	--	39.0	--	--	58.2	--
U- 6	Limestone and phosphatic, calcareous mudstone; fos. col. no. 48-KPM-8[1]	JWH-2086	4.7	7.8	22.0	62.9	36.66
U- 5	Mudstone, calcareous	JWH-2085	0.8	4.8	53.7	63.7	40.50
U- 4	Limestone, phosphatic, argillaceous	JWH-2084	1.1	11.8	30.3	64.8	53.48
U- 3	Mudstone, cherty, calcareous	JWH-2083	2.2	3.1	61.1	67.0	60.30
U- 2	Limestone, argillaceous	JWH-2082	0.8	3.4	41.9	67.8	63.02
U- 1	Mudstone, cherty, calcareous	JWH-2081	3.4	2.8	65.7	71.2	72.54
	Phosphatic shale member of Park City formation						
P-29	Mudstone, phosphatic, calcareous	JWH-2080	1.7	10.7	46.0	1.7	18.19
P-28	Limestone, argillaceous; fos. col. no. 48-KPM-7	JWH-2079	1.0	2.1	25.5	2.7	20.29
P-27	Mudstone, calcareous, phosphatic	JWH-2078	2.7	8.1	46.8	5.4	42.16
P-26	Mudstone, phosphatic and cherty limestone	JWH-2077	0.5	11.8	42.2	5.9	48.06
P-25	Mudstone, phosphatic, calcareous; fos. col. 48-KPM-6	JWH-2076	1.8	13.8	39.0	7.7	72.90
P-24	Chert, calcareous, argillaceous	JWH-2075	1.3	1.2	68.8	9.0	74.46
P-23	Mudstone, calcareous, phosphatic	JWH-2074	0.5	10.1	47.6	9.5	79.51
P-22	Chert, calcareous, argillaceous	JWH-2073	2.3	1.4	60.5	11.8	82.73
P-21	Chert, calcareous	JWH-2072	0.9	1.1	55.2	12.7	83.72
P-20	Mudstone, calcareous	JWH-2071	1.7	5.1	52.1	14.4	92.39
P-19	Mudstone, calcareous	JWH-2070	2.2	3.3	47.6	16.6	99.65
P-18	Mudstone, calcareous, and argillaceous limestone	JWH-2069	1.2	2.4	45.6	17.8	102.53
P-17	Limestone	JWH-2068	0.9	2.6	9.3	18.7	104.87
P-16	Mudstone, calcareous	JWH-2067	1.3	1.8	67.0	20.0	107.21
P-15	Limestone, dolomitic, cherty	JWH-2066	0.5	0.3	32.8	20.5	107.36
P-14	Mudstone, calcareous	JWH-2065	3.2	5.7	54.8	23.7	125.60
P-13	Chert, calcareous	JWH-2064	0.6	6.1	57.4	24.3	129.26

[1] Fossil collection made by K. P. McLaughlin, Paleontology and Stratigraphy Branch, U. S. Geological Survey.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
P-12	Limestone, dolomitic	JWH-2063	2.3	2.2	17.0	26.6	134.32
P-11	Limestone, argillaceous	JWH-2062	1.6	3.1	22.8	28.2	139.28
P-10	Limestone, dolomitic	JWH-2061	1.5	2.1	16.8	29.7	142.43
P- 9	Limestone, argillaceous; fos. col. no. 48-KPM-5	JWH-2060	1.8	5.0	35.6	31.5	151.43
P- 8	Limestone, argillaceous	JWH-2059	1.8	7.6	25.4	33.3	165.11
P- 7	Limestone, dolomitic; fos. col. no. 48-KPM-4	JWH-2058	3.5	1.5	16.4	36.8	170.36
P- 6	Limestone	JWH-2057	1.8	4.3	12.1	38.6	178.10
P- 5	Mudstone	JWH-2056	1.4	6.5	62.2	40.0	187.20
P- 4	Mudstone, phosphatic and phosphate rock	JWH-2055	1.1	13.6	37.2	41.1	202.16
P- 3	Phosphate rock and phosphatic mudstone	JWH-2054	1.7	21.5	22.4	42.8	238.71
P- 2	Limestone, dolomitic	JWH-2053	0.8	6.2	5.2	43.6	243.67
P- 1	Phosphate rock, argillaceous	JWH-2052	1.25	24.5	20.2	44.85	274.30
	Lower member of Park City formation—base not exposed						
L- 3	Sandstone, calcareous; fos. col. no. 48-KPM-3	JWH-2051	1.9	1.7	54.9	1.9	3.23
L- 2	Limestone and phosphatic sandstone	--	6.5	--	--	8.4	--
L- 1	Sandstone, calcareous	--	11.4	--	--	19.8	--

LAKE FORK, UTAH. LOT NO. 1235.

Phosphatic shale member of Park City formation sampled in two hand trenches cut obliquely down canyon from points approximately 125 feet above canyon bottom and approximately 150 yards above mouth of Mackentire Draw, NE¼NW¼ sec. 34, T. 2 N., R. 5 W., Duchesne County, Utah, the lower part on the west bank of the canyon and the upper part on the east bank. Beds strike N. 85° E. and dip 35° S. Section measured by J. W. Huddle and sampled by G. F. Hosford, D. P. Sprouse, and M. D. Stewart in 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Upper member of Park City formation—basal beds only						
U- 3	Limestone and phosphatic mudstone	JWH-2135	3.9	7.8	26.6	3.9	30.42
U- 2	Mudstone, calcareous, cherty	JWH-2134	1.0	3.3	67.5	4.9	33.72
U- 1	Mudstone, cherty, calcareous	JWH-2133	2.1	2.2	62.6	7.0	38.34
	Phosphatic shale member of Park City formation						
P-44	Mudstone, calcareous	JWH-2132	1.1	2.4	49.2	1.1	2.64
P-43	Mudstone and limestone	JWH-2131	1.2	3.7	58.2	2.3	7.08
P-42	Mudstone, phosphatic, and argillaceous limestone; fos. col. no. 48-KPM-13[1]	JWH-2130	2.1	11.8	35.5	4.4	31.86
P-41	Limestone, argillaceous, phosphatic	JWH-2129	1.6	11.3	33.7	6.0	49.94
P-40	Chert, calcareous; fos. col. no. 48-KPM-12	JWH-2128	1.0	1.4	61.3	7.0	51.34
P-39	Mudstone, calcareous, phosphatic; fos. col. no. 48-KPM-11	JWH-2127	3.5	9.9	41.3	10.5	85.99
P-38	Chert, limestone and calcareous, phosphatic mudstone; fos. col. no. 48-KPM-10	JWH-2126	2.4	2.7	69.4	12.9	92.47
P-37	Mudstone, calcareous, cherty	JWH-2125	1.5	1.6	71.6	14.4	94.87
P-36	Limestone and mudstone, cherty, and calcareous mudstone	JWH-2124	2.3	1.4	64.1	16.7	98.09
P-35	Mudstone and phosphate rock, calcareous and limestone	JWH-2123	0.75	10.2	47.9	17.45	105.74
P-34	Mudstone, calcareous	JWH-2122	1.6	2.1	53.1	19.05	109.10
P-33	Mudstone, calcareous	JWH-2121	1.7	3.7	59.6	20.75	115.39
--	Limestone lens, dolomitic	--	(0.8)	--	--	--	--
P-32	Mudstone, phosphatic, calcareous, cherty	JWH-2120	1.1	8.7	57.5	21.85	124.96
P-31	Mudstone, calcareous	JWH-2119	1.7	2.6	61.3	23.55	129.38
P-30	Limestone, argillaceous	JWH-2118	2.1	2.6	45.5	25.65	134.84
P-29	Limestone, argillaceous	JWH-2117	1.7	3.3	40.9	27.35	140.45
P-28	Mudstone, calcareous	JWH-2116	1.7	4.4	59.0	29.05	147.93
P-27	Mudstone, calcareous; fos. col. no. 48-KPM-9	JWH-2115	2.8	3.5	49.3	31.85	156.34

[1] Fossil collection made by K. P. McLaughlin, Paleontology and Stratigraphy Branch, U. S. Geological Survey.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
P-26	Phosphate rock, calcareous and mudstone	JWH-2114	0.5	16.0	28.5	32.35	163.51
--	Mudstone, calcareous	JWH-2113	(2.7)	2.6	50.9	--	--
--	Mudstone and calcareous phosphate rock	JWH-2112	(0.5)	12.7	31.3	--	--
	JWH-2113 is equivalent to JWH-2115 and JWH-2112 is equivalent to JWH-2114. Duplicate samples were collected from two trenches.						
P-25	Limestone, argillaceous	JWH-2111	1.9	3.2	20.2	34.25	169.59
P-24	Mudstone, calcareous, and dolomitic limestone	JWH-2110	2.5	3.1	39.5	36.75	177.34
P-23	Limestone, dolomitic	JWH-2109	2.4	1.3	18.0	39.15	180.46
P-22	Limestone, dolomitic, argillaceous	JWH-2108	1.1	3.4	40.7	40.25	184.20
P-21	Limestone, dolomitic and mudstone	JWH-2107	2.8	1.8	28.8	43.05	189.24
P-20	Mudstone and limestone	JWH-2106	3.6	4.9	56.6	46.65	206.88
P-19	Limestone, dolomitic	JWH-2105	3.2	1.2	19.6	49.85	210.72
P-18	Dolomite, calcareous	JWH-2104	2.0	1.5	19.6	51.85	213.72
P-17	Limestone, dolomitic and mudstone	JWH-2103	1.2	3.9	53.8	53.05	218.40
P-16	Mudstone, calcareous	JWH-2102	3.6	4.9	65.0	56.65	236.04
P-15	Limestone, argillaceous, dolomitic	JWH-2101	1.7	1.8	43.8	58.35	239.10
P-14	Mudstone	JWH-2100	1.2	4.8	72.0	59.55	244.86
P-13	Limestone, argillaceous	JWH-2099	2.3	5.5	30.0	61.85	257.51
P-12	Mudstone, phosphatic, calcareous	JWH-2098	0.7	14.1	36.0	62.55	267.38
P-11	Limestone, argillaceous; fos. col. no. 48-KPM-15	JWH-2097	1.5	1.1	20.3	64.05	269.03
P-10	Mudstone, calcareous	JWH-2096	1.2	4.1	56.1	65.25	273.95
P- 9	Phosphate rock, calcareous, and phosphatic mudstone	JWH-2095	1.0	15.5	32.1	66.25	289.45
P- 8	Phosphate rock and mudstone	JWH-2094	1.0	17.3	28.5	67.25	306.75
P- 7	Limestone, argillaceous	JWH-2093	1.9	1.5	26.9	69.15	309.60
P- 6	Phosphate rock and calcareous mudstone; fos. col. no. 48-KPM-14	JWH-2092	1.7	16.6	36.0	70.85	337.82
P- 5	Mudstone, phosphatic	JWH-2091	0.9	15.3	43.2	71.75	351.59
P- 4	Limestone, phosphatic, argillaceous	JWH-2090	2.9	11.9	34.1	74.65	386.10
P- 3	Phosphate rock, quartzitic	JWH-2089	0.8	21.4	22.6	75.45	403.22
P- 2	Sandstone, phosphatic	JWH-2088	1.9	14.1	56.9	77.35	430.01
P- 1	Sandstone and calcareous phosphate rock	JWH-2087	3.5	12.7	57.7	80.85	474.46
	Lower member of Park City formation—top bed only						
L- 1	Limestone	--	1.7	--	--	1.7	--

ROCK CANYON, UTAH. LOT NO. 1220.

Phosphatic shale member of Park City formation sampled in Rock Canyon in bulldozer expsure previously stripped to supply earth dam fill, SE¼ sec. 6, T. 3 S., R. 21 E., Uintah County, Utah, on south-dipping monocline. Beds strike N. 71° E. and dip 8° S. Section measured by D. M. Kinney and J. F. Rominger in August and sampled by R. P. Sheldon in September 1947. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	V_2O_5	Loss on ignition	Acid insoluble		
Upper member of Park City formation—basal bed only											
U- 1	Mudstone, calcareous, contains chert nodules	--	4.8	--	--	--	--	--	--	4.8	--
Phosphatic shale member of Park City formation											
P-26	Limestone, argillaceous	DMK-51-47	1.8	7.1	7.0	2.0	--	21.6	34.2	1.8	12.78
P-25	Mudstone, calcareous, phosphatic	DMK-50-47	2.4	10.4	3.1	2.12	0.011	16.1	37.0	4.2	37.74
P-24	Phosphate rock, calcareous	DMK-49-47	1.1	25.0	2.1	1.97	0.011	9.1	13.5	5.3	65.24
P-23	Dolomite, argillaceous and phosphate rock	DMK-48-47	1.9	6.3	3.9	1.57	0.010	23.2	34.1	7.2	77.21
P-22	Phosphate rock and phosphatic mudstone	DMK-47-47	0.5	23.7	3.4	2.27	0.008	5.4	25.2	7.7	89.06
P-21	Phosphate rock, argillaceous and mudstone	DMK-46-47	1.6	15.7	5.4	2.01	0.014	6.3	43.2	9.3	114.18
P-20	Phosphate rock, argillaceous, calcareous	DMK-45-47	0.9	20.8	1.8	1.57	0.008	8.8	25.2	10.2	132.90
P-19	Phosphate rock, argillaceous	DMK-44-47	1.9	21.6	3.3	1.86	0.015	7.3	25.9	12.1	173.94
P-18	Phosphate rock, argillaceous	DMK-43-47	0.9	19.4	5.4	1.90	0.015	7.3	31.1	13.0	191.40
P-17	Mudstone, phosphatic, calcareous	DMK-42-47	0.7	12.4	7.5	2.70	0.019	12.4	36.7	13.7	200.08
P-16	Chert, calcareous, phosphatic	DMK-41-47	1.0	8.1	2.1	2.78	0.008	9.9	54.7	14.7	208.18
P-15	Phosphate rock, calcareous	DMK-40-47	0.8	25.5	2.2	1.46	0.017	8.8	13.6	15.5	228.88
P-14	Mudstone, calcareous, phosphatic	DMK-39-47	0.2	11.8	7.3	1.83	0.026	4.1	37.1	15.7	230.94
P-13	Mudstone	DMK-38-47	1.3	4.6	3.6	3.36	0.01	3.4	78.2	17.0	236.92
P-12	Mudstone, phosphatic	DMK-37-47	0.6	10.0	8.7	2.67	0.026	5.1	60.2	17.6	242.92
P-11	Phosphate rock, cherty	DMK-36-47	0.1	19.6	1.3	1.83	0.007	2.9	42.9	17.7	244.88
P-10	Mudstone, phosphatic, contains iron oxide	DMK-35-47	0.05	12.0	11.9	3.18	0.032	7.3	49.6	17.75	245.48
P- 9	Mudstone, phosphatic	DMK-34-47	0.4	18.2	1.3	1.43	<0.005	2.4	48.5	18.15	252.76
P- 8	Mudstone, phosphatic	DMK-33-47	0.4	12.7	11.7	3.18	0.029	6.5	51.2	18.55	257.84
P- 7	Mudstone, phosphatic	DMK-32-47	0.2	16.8	3.0	1.75	0.015	3.7	48.1	18.75	261.20
P- 6	Phosphate rock, argillaceous	DMK-31-47	1.0	19.7	1.3	1.10	0.01	5.5	35.7	19.75	280.90
P- 5	Phosphate rock, argillaceous	DMK-30-47	1.3	25.4	2.2	1.32	<0.005	4.8	23.0	21.05	313.92
P- 4	Limestone, argillaceous	DMK-29-47	0.7	1.5	1.4	1.5	--	34.8	21.8	21.75	314.97
P- 3	Mudstone, calcareous, phosphatic	DMK-28-47	0.5	8.0	12.4	3.8	--	12.7	47.1	22.25	318.97
P- 2	Phosphate rock, sandy	DMK-27-47	0.4	18.2	1.3	1.5	--	3.6	44.4	22.65	326.25

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	V_2O_5	Loss on ignition	Acid insoluble		
P- 1	**Limestone, sandy**	DMK-26-47	0.5	7.0	1.0	2.9	--	19.0	39.3	23.15	329.75
				Weber sandstone							
Cw-1	**Sandstone**	--	1.0	--	--	--	--	--	--	--	--

BRUSH CREEK GORGE, UTAH. LOT NO. 1219.

Phosphatic shale member of Park City formation sampled in Brush Creek Gorge, SW¼NW¼ sec. 32, T. 2 S., R. 22 E., Uintah County, Utah, on south flank of Uinta Range. Section exposed in trench, previously dug by Humphreys Phosphate Company, at end of automobile road at mouth of Brush Creek Gorge. Beds strike N. 80° E., dip 7° S. Section measured by D. M. Kinney and J. F. Rominger in August 1947 and sampled by R. P. Sheldon in September 1947. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	F	Loss on ignition	Acid insoluble		
	Upper member of Park City formation—not measured										
	Phosphatic shale member of Park City formation										
P-25	Mudstone, calcareous	DMK-25-47	1.0	5.5	7.9	2.89	0.69	17.1	43.6	1.0	5.50
P-24	Limestone, argillaceous	DMK-24-47	1.3	1.5	2.1	2.67	--	25.3	38.7	2.3	7.45
P-23	Mudstone, calcareous and chert	DMK 23-47	2.2	2.5	4.4	3.40	--	17.3	49.8	4.5	12.95
P-22	Mudstone, calcareous	DMK-22-47	1.4	4.1	6.8	2.45	0.39	12.7	56.6	5.9	18.69
P-21	Dolomite, argillaceous	DMK-21-47	0.7	5.4	1.8	1.94	0.59	27.0	24.2	6.6	22.47
P-20	Phosphate rock, calcareous	DMK-20-47	1.3	19.1	2.5	1.28	--	15.5	14.6	7.9	47.3
P-19	Phosphate rock	DMK-19-47	1.5	28.3	1.8	1.14	2.79	9.4	14.1	9.4	89.75
P-18	Dolomite, phosphatic, argillaceous	DMK-18-47	0.5	10.6	3.8	1.47	--	23.0	20.8	9.9	95.05
P-17	Limestone, phosphatic	DMK-17-47	0.6	8.6	2.9	2.16	--	26.6	16.9	10.5	100.21
P-16	Phosphate rock, calcareous, and phosphatic mudstone	DMK-16-47	3.4	16.9	4.5	2.05	1.68	8.0	34.4	13.9	157.67
P-15	Phosphate rock	DMK-15-47	3.1	27.2	2.3	1.17	--	7.7	12.5	17.0	241.99
P-14	Chert, phosphatic, dolomitic	DMK-14-47	1.3	9.4	3.5	3.33	--	7.1	54.5	18.3	254.21
P-13	Phosphate rock	DMK-13-47	0.5	27.7	3.2	1.46	--	6.1	13.5	18.8	268.06
P-12	Phosphate rock, argillaceous	DMK-12-47	0.5	15.1	7.0	3.14	1.45	7.8	37.6	19.3	275.61
P-11	Dolomite, cherty	DMK-11-47	0.4	3.1	2.2	2.96	--	24.7	35.4	19.7	276.85
P-10	Phosphate rock, argillaceous	DMK-10-47	2.7	22.0	2.1	2.05	--	7.0	23.5	22.4	336.25
P- 9	Mudstone, phosphatic	DMK- 9-47	0.8	10.3	8.6	3.11	--	6.6	54.2	23.2	344.49
P- 8	Phosphate rock, contains iron oxide	DMK- 8-47	0.025	25.9	2.4	6.91	2.74	7.2	15.2	23.22	345.14
P- 7	Phosphate rock	DMK- 7-47	0.3	28.5	2.2	2.09	2.9	5.6	13.8	23.52	353.69
P- 6	Mudstone, phosphatic	DMK- 6-47	0.05	12.0	10.9	3.51	1.47	6.4	51.1	23.57	354.29
P- 5	Phosphate rock	DMK- 5-47	2.65	27.3	2.0	1.53	2.59	5.9	18.0	26.22	426.64
P- 4	Dolomite	DMK- 4-47	0.5	2.8	2.8	1.74	--	37.4	11.1	26.72	428.04
P- 3	Mudstone, phosphatic, contains gypsum	DMK- 3-47	0.4	10.6	14.1	4.94	--	10.2	41.7	27.12	432.28
P- 2	Mudstone, phosphatic, contains gypsum	DMK- 2-47	0.2	10.2	14.8	5.41	--	12.7	38.8	27.32	434.32
P- 1	Phosphate rock, sandy	DMK- 1-47	0.5	20.0	1.9	2.38	--	2.4	41.9	27.82	444.32
	Weber formation—not measured										

LITTLE BRUSH CREEK, UTAH. LOT NO. 1221.

Phosphatic shale member of Park City formation sampled in natural exposures and bulldozer excavations prepared by Humphreys Phosphate Company, 1 mile west of Little Brush Creek, SE¼NE¼ sec. 22, T. 2 S., R. 22 E., Uintah County, Utah, on south-dipping monocline. Beds strike N. 50° E. and dip 70° S. Section measured by D. M. Kinney and J. F. Rominger in August and sampled by R. P. Sheldon in September 1947. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
Upper member of Park City formation—basal bed only										
U- 1	Limestone	--	6.0	--	--	--	--	--	--	--
Phosphatic shale member of Park City formation										
P-23	Chert and calcareous mudstone	DMK-74-47	5.0	2.9	5.6	2.9	14.3	58.2	5.0	14.50
P-22	Mudstone, phosphatic, calcareous	DMK-73-47	0.3	12.4	3.8	1.83	2.7	38.7	5.3	18.22
P-21	Mudstone, phosphatic, calcareous	DMK-72-47	0.2	11.9	2.2	1.61	11.5	42.2	5.5	20.60
P-20	Phosphate rock, calcareous	DMK-71-47	1.0	16.7	2.5	1.54	7.6	17.5	6.5	37.30
P-19	Phosphate rock, calcareous	DMK-70-47	0.9	24.7	1.9	1.15	9.2	15.2	7.4	59.53
P-18	Mudstone, calcareous, phosphatic	DMK-69-47	0.4	8.5	0.7	1.32	1.2	51.3	7.8	62.93
P-17	Limestone, argillaceous	DMK-68-47	0.4	4.6	2.5	1.39	17.7	27.6	8.2	64.77
P-16	Phosphate rock, calcareous	DMK-67-47	0.3	22.1	2.8	1.68	1.1	17.7	8.5	71.40
P-15	Limestone	DMK-66-47	0.4	6.5	3.0	1.24	30.2	18.2	8.9	74.00
P-14	Phosphate rock	DMK-65-47	0.9	24.6	3.6	1.46	8.8	16.8	9.8	96.14
P-13	Phosphate rock, argillaceous, calcareous	DMK-64-47	0.4	14.6	5.6	2.52	12.8	32.3	10.2	101.98
P-12	Phosphate rock, calcareous	DMK-63-47	0.5	20.7	5.5	2.32	4.9	32.4	10.7	112.33
P-11	Mudstone, cherty	DMK-62-47	0.3	6.5	4.0	2.19	4.7	70.1	11.0	114.28
P-10	Phosphate rock	DMK-61-47	3.6	27.5	2.7	1.39	6.4	15.7	14.6	213.28
P- 9	Mudstone	DMK-60-47	0.5	6.8	3.1	3.40	4.7	67.7	15.1	216.68
P- 8	Phosphate rock, calcareous and mudstone	DMK-59-47	1.6	19.4	5.1	2.19	8.6	23.8	16.7	247.72
P- 7	Mudstone, calcareous	DMK-58-47	0.6	5.6	2.1	3.03	12.9	54.0	17.3	251.08
P- 6	Limestone, argillaceous, phosphatic	DMK-57-47	1.9	27.9	2.4	1.61	7.3	10.7	19.2	304.09
P- 5	Mudstone, phosphatic	DMK-56-47	0.5	12.4	9.5	3.00	5.6	53.0	19.7	310.29
P- 4	Phosphate rock	DMK-55-47	2.2	28.2	2.1	1.46	4.5	15.9	21.9	372.33
P- 3	Limestone	DMK-54-47	0.8	5.6	3.6	1.57	32.4	14.8	22.7	376.81
P- 2	Mudstone, phosphatic, calcareous	DMK-53-47	0.4	12.3	13.5	4.57	7.7	43.1	23.1	381.73
P- 1	Phosphate rock, sandy	DMK-52-47	0.4	17.0	2.3	3.47	2.9	47.5	23.5	388.53
Weber sandstone—not measured										

RIGHT FORK OF HOBBLE CREEK, UTAH. LOT NO. 1271.

Phosphatic shale member of Park City formation sampled on north and south sides of Right Fork of Hobble Creek, Utah County, Utah, sec. 19?, T. 7 S., R. 5 E., Beds P-121 through P-126 and P-143 through U-1 sampled in trench on north side; all others in two trenches on south side. Beds strike N. 35° E. and dip 65° NW. Section measured by L. E. Smith, R. S. Sears, G. F. Hosford, D. P. Sprouse, and M. D. Stewart and sampled by Hosford, Sprouse and Stewart in August 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Upper member of Park City formation—basal bed only						
U- 1	Mudstone, calcareous	LES-2294	2.6	1.4	67.3	2.6	3.64
	Phosphatic shale member of Park City formation						
P-155	Chert	LES-2293	0.8	3.6	70.0	0.8	2.88
P-154	Mudstone, calcareous, and argillaceous calcareous phosphate rock	LES-2292	0.4	7.3	54.2	1.2	5.80
P-153	Mudstone, calcareous	LES-2291	2.0	1.9	62.0	3.2	9.60
P-152	Mudstone, cherty, calcareous	LES-2290	0.75	1.7	65.6	3.95	10.88
P-151	Mudstone, calcareous	LES-2289	0.7	2.1	68.7	4.65	12.34
P-150	Chert	LES-2288	0.65	1.5	50.0	5.3	13.32
P-149	Mudstone, calcareous	LES-2287	0.4	6.4	60.2	5.70	15.88
P-148	Mudstone and chert	LES-2286	0.55	1.2	75.8	6.25	16.54
P-147	Mudstone and chert	LES-2285	1.6	1.4	74.5	7.85	18.78
P-146	Mudstone and chert	LES-2284	0.5	3.9	69.4	8.35	20.73
P-145	Phosphate rock, argillaceous	LES-2283	0.8	18.7	37.8	9.15	35.69
P-144	Mudstone and cherty phosphate rock	LES-2282	0.6	13.5	47.7	9.75	43.79
P-143	Chert and limestone	LES-2281	2.4	1.3	70.2	12.15	46.91
P-142	Mudstone, calcareous	GFH-2306	2.15	2.3	57.1	14.30	51.86
P-141	Mudstone and chert, calcareous	GFH-2305	0.85	1.7	60.6	15.15	53.30
P-140	Mudstone, calcareous and chert	GFH-2304	3.25	1.6	68.1	18.40	58.50
P-139	Mudstone, calcareous and chert	GFH-2303	1.7	2.0	74.6	20.10	61.90
P-138	Mudstone, calcareous	GFH-2302	0.85	3.9	62.5	20.95	65.22
P-137	Chert and mudstone	GFH-2301	0.8	1.7	65.4	21.75	66.58
P-136	Limestone, argillaceous	DPS-2366	0.55	3.2	32.8	22.30	68.34
P-135	Mudstone, cherty, calcareous	DPS-2365	1.6	2.5	67.7	23.90	72.34
P-134	Mudstone and limestone	DPS-2364	2.75	2.6	63.6	26.65	79.48
P-133	Mudstone, calcareous, cherty	DPS-2363	2.45	3.2	58.5	29.10	87.33
P-132	Mudstone, calcareous, cherty	DPS-2362	0.7	2.3	57.5	29.80	88.94
P-131	Mudstone, cherty, calcareous	DPS-2361	1.8	5.2	51.2	31.60	98.30
P-130	Limestone	GFH-2313	0.3	4.3	11.6	31.90	99.58
P-129	Mudstone, calcareous	GFH-2312	1.1	2.6	56.4	33.00	102.44

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
P-128	Mudstone, calcareous	GFH-2311	0.95	1.5	46.7	33.95	103.87
P-127	Mudstone, calcareous	GFH-2310	0.8	2.5	57.6	34.75	105.87
	Sample GFH-2310 represents a thickness of 2.3 feet, the lower 1.5 feet of which is equivalent to the upper 1.5 feet of sample RSS-2268.						
P-126	Mudstone, calcareous	RSS- 2268	2.0	2.3	61.4	36.75	110.47
P-125	Mudstone, calcareous	RSS- 2267	3.0	2.4	63.3	39.75	117.67
P-124	Mudstone, calcareous	RSS- 2266	2.5	2.6	65.6	42.25	124.17
P-123	Mudstone, calcareous	RSS- 2265	1.8	3.2	65.6	44.05	129.93
--	Mudstone, calcareous	GFH-2309	(1.3)	2.2	63.3	--	--
--	Mudstone, calcareous	GFH-2308	(3.2)	2.6	63.2	--	--
--	Mudstone and chert, calcareous	GFH-2307	(2.1)	2.8	61.0	--	--
P-122	Mudstone, phosphatic, contains pyrite	RSS- 2264	0.2	13.4	42.1	44.25	132.61
P-121	Mudstone, calcareous	RSS- 2263	0.9	4.2	59.4	45.15	136.39
P-120	Phosphate rock, argillaceous	MDS-2185	0.6	23.2	20.1	45.75	150.31
P-119	Mudstone, cherty, phosphatic	MDS-2184	1.1	8.2	59.8	46.85	159.33
P-118	Limestone, argillaceous	MDS-2183	0.8	2.7	39.3	47.65	161.49
P-117	Mudstone, cherty	MDS-2182	3.6	3.5	72.2	51.25	174.09
P-116	Mudstone, cherty	MDS-2181	0.7	4.3	76.5	51.95	177.10
P-115	Mudstone	GFH-2330	0.3	5.8	64.8	52.25	178.84
P-114	Mudstone, phosphatic	GFH-2329	0.5	15.7	43.5	52.75	186.69
P-113	Limestone, argillaceous	GFH-2328	0.5	4.7	35.0	53.25	189.04
P-112	Phosphate rock, argillaceous	GFH-2327	0.4	17.3	36.0	53.65	195.96
P-111	Mudstone	GFH-2326	0.55	7.0	62.2	54.20	199.81
P-110	Phosphate rock and mudstone	GFH-2325	0.8	17.8	43.3	55.00	214.05
P-109	Mudstone	GFH-2324	1.45	6.1	72.9	56.45	222.90
P-108	Mudstone, phosphatic	GFH-2323	0.3	11.2	56.8	56.75	226.26
--	Limestone lens	GFH-2331	(1.65)	1.4	17.7	--	--
P-107	Mudstone, calcareous	GFH-2322	0.85	4.2	62.3	57.60	229.82
P-106	Mudstone, calcareous	GFH-2321	2.3	4.0	65.4	59.90	239.02
P-105	Mudstone, calcareous	GFH-2320	1.5	4.2	65.0	61.40	245.32
P-104	Mudstone, calcareous	MDS-2180	0.4	7.7	46.9	61.80	248.40
P-103	Mudstone, calcareous	MDS-2179	3.6	4.5	60.1	65.40	264.60
P-102	Mudstone	MDS-2178	1.25	5.8	63.6	66.65	271.86
P-101	Mudstone, calcareous	MDS-2177	3.0	5.0	58.4	69.65	286.86
P-100	Mudstone, phosphatic	MDS-2176	0.3	12.3	49.2	69.95	290.54
P- 99	Mudstone	MDS-2175	3.5	5.2	63.1	73.45	308.74
P- 98	Phosphate rock, argillaceous	MDS-2174	0.55	19.2	30.9	74.00	319.30
P- 97	Mudstone, cherty	MDS-2173	1.8	1.5	78.8	75.80	322.00
P- 96	Mudstone	MDS-2172	0.9	1.4	79.7	76.70	323.26

P- 95	Mudstone, phosphatic, and calcareous mudstone	MDS-2171	0.7	5.8	46.5	77.40	327.32
P- 94	Limestone and calcareous mudstone	GFH-2319	2.55	1.8	40.5	79.95	331.92
P- 93	Mudstone, cherty, calcareous	GFH-2318	3.05	1.3	55.3	83.00	335.88
P- 92	Limestone, cherty	GFH-2317	2.2	2.2	44.6	85.20	340.72
P- 91	Limestone and chert	GFH-2316	3.4	1.6	53.1	88.60	346.16
P- 90	Phosphate rock, calcareous, cherty	GFH-2315	0.6	14.3	30.0	89.20	354.74
P- 89	Phosphate rock, calcareous, argillaceous	GFH-2314	0.65	13.9	29.7	89.85	363.78
P- 88	Mudstone, phosphatic	DPS-2376	1.4	10.5	56.3	91.25	378.48
P- 87	Mudstone, phosphatic	DPS-2375	1.9	10.3	57.8	93.15	398.04
P- 86	Phosphate rock, argillaceous	DPS-2374	0.45	18.2	38.5	93.60	406.24
P- 85	Mudstone, cherty, phosphatic	DPS-2373	0.85	14.1	46.5	94.45	418.22
P- 84	Mudstone, phosphatic	DPS-2372	0.35	15.6	51.1	94.80	423.68
P- 83	Mudstone, phosphatic	DPS-2371	2.0	14.9	45.9	96.80	453.48
P- 82	Phosphate rock, argillaceous	DPS-2370	0.35	19.7	38.6	97.15	460.38
P- 81	Mudstone, phosphatic	DPS-2369	2.35	8.5	60.6	99.50	480.35
P- 80	Phosphate rock, argillaceous	DPS-2368	0.45	16.3	41.2	99.95	487.68
P- 79	Phosphate rock, argillaceous	DPS-2367	0.6	21.4	30.3	100.55	500.52
P- 78	Mudstone, calcareous, cherty	DPS-2387	0.95	2.1	68.9	101.50	502.52
P- 77	Mudstone, cherty, calcareous	DPS-2386	1.3	1.7	70.7	102.80	504.73
P- 76	Mudstone, calcareous, cherty	DPS-2385	1.45	2.2	68.9	104.25	507.92
P- 75	Mudstone, calcareous, cherty	DPS-2384	2.1	2.6	69.7	106.35	513.38
P- 74	Mudstone, cherty, calcareous	DPS-2383	1.25	2.4	69.9	107.60	516.38
P- 73	Mudstone and cherty limestone	DPS-2382	1.6	2.5	68.4	109.20	520.38
P- 72	Mudstone, cherty, calcareous	DPS-2381	1.25	2.4	72.6	110.45	523.38
P- 71	Mudstone, cherty, calcareous	DPS-2380	1.7	2.8	67.4	112.15	528.14
P- 70	Mudstone, calcareous, cherty	DPS-2379	1.4	2.5	70.7	113.55	531.64
P- 69	Mudstone, calcareous, cherty	DPS-2378	2.6	3.4	65.7	116.15	540.48
P- 68	Limestone and mudstone	DPS-2377	1.15	1.6	44.0	117.30	547.32
P- 67	Mudstone, calcareous	MDS-2191	4.0	4.7	57.0	121.30	561.12
P- 66	Mudstone, calcareous	MDS-2190	3.8	4.5	63.6	125.10	578.22
P- 65	Mudstone, calcareous	MDS-2189	3.1	4.1	64.7	128.20	590.93
P- 64	Phosphate rock, argillaceous	MDS-2188	1.2	17.0	39.3	129.40	611.33
P- 63	Phosphate rock, argillaceous	MDS-2187	0.8	20.5	31.0	130.20	627.73
P- 62	Phosphate rock, argillaceous	MDS-2186	0.8	19.6	36.0	131.00	643.41
P- 61	Mudstone, calcareous	RSS-2262	1.65	5.3	60.7	132.65	652.16
P- 60	Mudstone	RSS-2261	2.3	6.6	66.2	134.95	667.34
P- 59	Mudstone, phosphatic	RSS-2260	0.4	10.8	55.5	135.35	671.66
P- 58	Mudstone, phosphatic	RSS-2259	0.3	15.2	47.8	135.65	676.22
P- 57	Mudstone, calcareous	RSS-2258	3.1	7.6	54.8	138.75	699.78
P- 56	Mudstone, phosphatic, calcareous	RSS-2257	1.8	8.9	55.1	140.55	715.80
P- 55	Mudstone, phosphatic	RSS-2256	2.9	9.2	55.3	143.45	742.48
P- 54	Limestone, argillaceous	RSS-2255	0.5	3.2	21.0	143.95	744.08
P- 53	Mudstone, calcareous	RSS-2254	2.8	7.6	53.3	146.75	765.36
P- 52	Mudstone, phosphatic, calcareous	RSS-2253	1.8	8.8	51.3	148.55	781.20

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
P- 51	Mudstone, phosphatic, calcareous	RSS-2252	1.7	9.2	51.7	150.25	796.84
P- 50	Mudstone, phosphatic, calcareous	RSS-2251	2.7	9.3	50.5	152.95	821.94
P- 49	Phosphate rock, argillaceous	RSS-2250	0.4	15.7	37.0	153.35	828.22
P- 48	Limestone	RSS-2249	1.2	4.7	17.8	154.55	833.86
P- 47	Mudstone, calcareous	RSS-2248	1.7	7.4	50.9	156.25	846.44
P- 46	Mudstone, calcareous	RSS-2247	0.8	6.7	50.5	157.05	851.80
P- 45	Mudstone, calcareous	RSS-2246	2.7	6.8	56.2	159.75	870.16
P- 44	Mudstone, calcareous	RSS-2245	3.3	6.3	55.8	163.05	890.96
P- 43	Phosphate rock, argillaceous	RSS-2244	0.8	20.1	26.8	163.85	907.04
P- 42	Mudstone, calcareous	RSS-2243	0.55	2.2	60.3	164.40	908.24
P- 41	Phosphate rock, calcareous, contains pyrite	RSS-2242	0.4	17.1	18.1	164.80	915.09
P- 40	Limestone, argillaceous	RSS-2241	0.55	2.7	22.7	165.35	916.57
P- 39	Mudstone, calcareous	RSS-2240	0.7	3.5	49.6	166.05	919.02
P- 38	Mudstone, calcareous	RSS-2239	1.6	3.6	59.4	167.65	924.78
P- 37	Mudstone, calcareous	RSS-2238	0.5	3.5	59.8	168.15	926.53
P- 36	Phosphate rock, argillaceous	RSS-2237	0.4	15.0	34.2	168.55	932.53
P- 35	Mudstone, calcareous	RSS-2236	1.0	1.5	49.6	169.55	934.03
P- 34	Limestone, argillaceous	RSS-2235	2.0	1.3	47.7	171.55	936.63
P- 33	Phosphate rock, argillaceous	RSS-2234	0.3	16.2	39.5	171.85	941.49
P- 32	Limestone, argillaceous	RSS-2233	1.6	0.7	40.1	173.45	942.61
P- 31	Mudstone, calcareous	RSS-2232	1.3	1.8	56.1	174.75	944.95
P- 30	Mudstone, calcareous	RSS-2231	1.45	1.8	53.3	176.20	947.56
P- 29	Mudstone, calcareous, cherty	RSS-2230	0.4	2.0	48.7	176.60	948.36
P- 28	Mudstone, calcareous	RSS-2229	0.77	2.6	50.8	177.37	950.36
P- 27	Mudstone, calcareous	RSS-2228	1.1	1.9	51.7	178.47	952.45
P- 26	Mudstone, calcareous	RSS-2227	0.6	2.8	55.8	179.07	954.13
P- 25	Mudstone, calcareous	RSS-2226	0.8	5.2	56.1	179.87	958.29
P- 24	Mudstone, cherty, calcareous	RSS-2225	1.75	2.7	56.2	181.62	963.02
P- 23	Mudstone, calcareous, cherty	RSS-2224	1.45	2.6	65.1	183.07	966.79
P- 22	Mudstone, calcareous, cherty	RSS-2223	1.8	1.3	65.7	184.87	969.13
P- 21	Mudstone, calcareous	RSS-2222	1.4	1.8	68.4	186.27	971.65
P- 20	Mudstone, calcareous	RSS-2221	0.35	3.6	59.9	186.62	972.91
P- 19	Mudstone, cherty, calcareous	RSS-2220	1.6	1.5	70.3	188.22	975.31
P- 18	Mudstone, calcareous	RSS-2219	0.35	4.2	65.3	188.57	976.78
P- 17	Mudstone, calcareous, cherty	RSS-2218	1.5	1.3	64.5	190.07	978.73
P- 16	Mudstone, calcareous	RSS-2217	3.2	1.7	67.2	193.27	984.17
P- 15	Mudstone, calcareous	RSS-2216	2.5	1.7	64.3	195.77	988.42
P- 14	Mudstone, calcareous	RSS-2215	0.8	3.8	50.1	196.57	991.46
P- 13	Limestone, argillaceous	RSS-2214	1.6	1.6	47.0	198.17	994.02
P- 12	Mudstone, calcareous	RSS-2213	0.8	3.6	49.5	198.97	996.90

P- 11	Mudstone, calcareous	RSS-2212	2.1	2.1	51.0	201.07	1,001.31
P- 10	Limestone, argillaceous	RSS-2211	2.0	1.7	47.9	203.07	1,004.71
P- 9	Limestone, argillaceous	RSS-2210	1.0	1.5	40.5	204.07	1,006.21
P- 8	Limestone, argillaceous	RSS-2209	1.8	1.6	43.9	205.87	1,009.09
P- 7	Limestone, argillaceous	RSS-2208	1.3	1.8	43.4	207.17	1,011.43
P- 6	Mudstone, calcareous	RSS-2207	0.4	4.7	48.1	207.57	1,013.31
P- 5	Phosphate rock, argillaceous, calcareous	RSS-2206	0.6	18.8	27.6	208.17	1,024.59
P- 4	Limestone, argillaceous	RSS-2205	0.9	3.2	32.7	209.07	1,027.47
P- 3	Mudstone, calcareous	RSS-2204	1.0	6.2	47.5	210.07	1,033.67
P- 2	Mudstone, calcareous	RSS-2203	0.6	7.4	46.8	210.67	1,038.11
P- 1	Phosphate rock and mudstone	RSS-2202	0.7	23.2	17.1	211.37	1,054.35
	Lower member of Park City formation—top bed only						
L- 1	Limestone	RSS-2201	4.9	0.6	7.8	4.9	2.94

WANRHODES CANYON, UTAH. LOT NO. 1270.

Phosphatic shale member of Park City formation sampled in hand trench at bottom of Wanrhodes Canyon, secs. 14 and 15, T. 8 S., R. 4 E., Utah County, Utah. Beds strike N. 36° E. and dip 52° SE. Section measured and sampled by G. F. Hosford, D. P. Sprouse, and M. D. Stewart in August and September 1948. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Upper member of Park City formation—basal beds only						
U- 7	Limestone	--	1.0	--	--	1.0	--
U- 6	Limestone	--	0.5	--	--	1.5	--
U- 5	Limestone	--	0.85	--	--	2.35	--
U- 4	Limestone, cherty	--	1.7	--	--	4.05	--
U- 3	Limestone, cherty	--	0.9	--	--	4.95	--
U- 2	Limestone, cherty	--	0.6	--	--	5.55	--
U- 1	Mudstone, calcareous	GFH-2596	2.6	2.0	58.5	8.15	5.20
	Phosphatic shale member of Park City formation						
P-219	Mudstone, calcareous	GFH-2595	0.4	2.6	67.3	0.4	1.04
P-218	Mudstone, calcareous	GFH-2594	0.9	4.2	66.0	1.3	4.82
P-217	Mudstone, calcareous	GFH-2593	1.35	3.9	67.3	2.65	10.08
P-216	Mudstone	GFH-2592	0.45	4.1	70.8	3.10	11.93
P-215	Mudstone	GFH-2591	0.9	4.6	70.0	4.00	16.07
P-214	Mudstone, calcareous	GFH-2590	1.0	4.4	64.0	5.00	20.47
P-213	Mudstone	GFH-2589	0.55	6.9	61.0	5.55	24.26
P-212	Phosphate rock, argillaceous	GFH-2588	0.45	21.3	27.7	6.00	33.85
P-211	Mudstone, calcareous	GFH-2587	2.2	4.3	67.8	8.20	43.31
P-210	Mudstone and phosphate rock	GFH-2586	0.8	4.5	71.8	9.00	46.91
P-209	Mudstone, phosphatic	GFH-2585	0.55	8.3	63.5	9.55	51.48
P-208	Mudstone	GFH-2584	1.2	5.3	72.5	10.75	57.84
P-207	Mudstone	GFH-2583	0.45	4.5	73.8	11.20	59.86
P-206	Mudstone, phosphatic	GFH-2582	0.75	16.9	43.2	11.95	72.54
P-205	Mudstone	GFH-2581	0.65	6.5	63.7	12.60	76.76
P-204	Mudstone	GFH-2580	2.85	4.8	71.2	15.45	90.44
P-203	Mudstone	GFH-2579	1.7	5.2	69.8	17.15	99.28
P-202	Mudstone	GFH-2578	1.0	5.9	70.5	18.15	105.18
P-201	Mudstone	GFH-2577	0.9	5.5	67.0	19.05	110.13
P-200	Mudstone	GFH-2576	0.8	7.4	66.3	19.85	116.05
P-199	Mudstone	GFH-2575	0.4	3.5	72.5	20.25	117.45
P-198	Mudstone and chert	GFH-2574	1.9	5.0	68.3	22.15	126.95
P-197	Mudstone	GFH-2573	2.2	5.4	68.7	24.35	138.83
P-196	Mudstone	GFH-2572	0.8	6.1	68.2	25.15	143.71
P-195	Mudstone	GFH-2571	1.05	6.4	69.0	26.20	150.43

P-194	Mudstone	GFH-2570	1.5	6.8	67.0	27.70	160.63
P-193	Chert and mudstone	GFH-2569	1.35	5.7	70.3	29.05	168.33
P-192	Mudstone	GFH-2568	1.1	5.9	68.2	30.15	174.82
P-191	Mudstone	GFH-2567	0.45	4.7	72.0	30.60	176.93
P-190	Mudstone	GFH-2566	0.6	5.3	69.7	31.20	180.11
P-189	Mudstone	GFH-2565	0.6	5.2	70.8	31.80	183.23
P-188	Mudstone	GFH-2564	0.75	5.7	68.0	32.55	187.50
P-187	Mudstone and phosphate rock	GFH-2563	0.45	16.6	43.2	33.00	194.98
P-186	Chert	GFH-2562	0.6	3.1	78.7	33.60	196.84
P-185	Mudstone, cherty	GFH-2561	1.5	1.9	70.3	35.10	199.68
P-184	Mudstone	GFH-2560	1.35	2.5	72.3	36.45	203.06
P-183	Mudstone, phosphatic	GFH-2559	0.6	11.7	56.3	37.05	210.08
P-182	Mudstone	GFH-2558	1.8	2.6	78.7	38.85	214.76
P-181	Mudstone, calcareous, phosphatic	GFH-2557	0.9	9.0	52.0	39.65	221.96
P-180	Limestone, argillaceous	GFH-2556	0.55	2.2	36.0	40.20	223.17
P-179	Mudstone, phosphatic	GFH-2555	0.3	8.4	56.7	40.50	225.69
P-178	Mudstone, calcareous	GFH-2554	1.2	1.6	60.2	41.70	227.61
P-177	Mudstone, calcareous	GFH-2553	0.6	2.1	54.7	42.30	228.87
P-176	Mudstone, calcareous	GFH-2552	1.1	0.9	53.0	43.40	229.86
P-175	Limestone, argillaceous	GFH-2551	0.75	1.2	31.7	44.15	230.76
P-174	Limestone, argillaceous	GFH-2360	0.4	5.5	41.9	44.55	232.96
P-173	Mudstone, calcareous	GFH-2359	2.85	1.9	53.7	47.40	238.38
P-172	Mudstone, calcareous	GFH-2358	1.1	0.8	54.8	48.50	239.26
P-171	Limestone, argillaceous	GFH-2357	1.2	0.5	38.7	49.70	239.86
P-170	Mudstone, calcareous	GFH-2356	1.25	0.8	60.8	50.95	240.86
P-169	Mudstone, calcareous, phosphatic	GFH-2355	0.5	9.5	37.0	51.45	245.60
P-168	Mudstone, phosphatic and chert	GFH-2354	2.0	8.3	56.8	53.45	262.20
P-167	Chert	GFH-2353	0.3	4.5	72.3	53.75	263.56
P-166	Chert	GFH-2352	0.5	6.1	66.2	54.25	266.60
P-165	Chert	GFH-2351	0.45	5.5	66.2	54.70	269.08
P-164	Phosphate rock, argillaceous	GFH-2350	1.0	17.7	33.5	55.70	286.78
P-163	Chert, calcareous	GFH-2349	1.8	1.7	62.3	57.50	289.84
P-162	Chert	GFH-2348	1.0	2.2	81.0	58.50	292.04
P-161	Chert	GFH-2347	1.4	4.3	78.0	59.90	298.06
P-160	Mudstone, cherty	GFH-2346	1.2	3.1	79.5	61.10	301.78
P-159	Chert	GFH-2345	0.55	6.3	70.3	61.65	305.24
P-158	Mudstone, phosphatic	GFH-2344	0.65	14.1	55.0	62.30	314.41
P-157	Phosphate rock, argillaceous	GFH-2343	0.3	21.3	33.7	62.60	320.80
P-156	Phosphate rock, argillaceous	GFH-2342	0.9	21.1	34.8	63.50	339.79
P-155	Mudstone	GFH-2341	0.35	7.5	70.0	63.85	342.42
P-154	Mudstone	GFH-2340	1.0	5.3	74.7	64.85	347.72
P-153	Mudstone	GFH-2339	0.55	6.1	76.5	65.40	351.07
P-152	Phosphate rock, argillaceous	GFH 2338	0.3	25.6	26.2	65.70	358.75
P-151	Phosphate rock, argillaceous	GFH-2337	1.9	24.7	30.5	67.60	405.68
P-150	Chert and mudstone	GFH-2336	0.4	7.1	73.8	68.00	408.52

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
P-149	Chert	GFH-2335	0.8	5.0	80.2	68.80	412.52
P-148	Mudstone	GFH-2334	1.2	7.7	71.7	70.00	421.76
P-147	Phosphate rock and mudstone	GFH-2333	0.45	20.5	41.0	70.45	430.98
P-146	Limestone	GFH-2332	1.9	1.8	18.3	72.35	434.40
P-145	Mudstone, cherty	DPS-2451	0.55	4.0	72.3	72.90	436.60
P-144	Mudstone, cherty	DPS-2450	1.2	5.4	80.9	74.10	443.08
P-143	Mudstone, phosphatic, cherty	DPS-2449	0.5	10.8	65.8	74.60	448.48
P-142	Mudstone, cherty	DPS-2448	0.75	5.8	79.8	75.35	452.84
P-141	Mudstone	DPS-2447	1.05	7.5	69.3	76.40	460.71
P-140	Mudstone, phosphatic	DPS-2446	0.3	17.7	46.7	76.70	466.02
P-139	Mudstone, phosphatic	DPS-2445	0.4	8.3	63.3	77.10	469.34
P-138	Mudstone, cherty	DPS-2444	0.6	4.9	66.5	77.70	472.28
P-137	Mudstone, calcareous	DPS-2443	1.45	4.3	48.5	79.15	478.52
P-136	Mudstone, cherty	DPS-2442	0.55	7.0	72.1	79.70	482.36
P-135	Mudstone	DPS-2441	0.75	7.5	68.7	80.45	487.99
P-134	Mudstone	DPS-2440	1.1	7.7	70.5	81.55	496.46
P-133	Mudstone, phosphatic	DPS-2439	0.75	10.7	59.7	82.30	504.48
P-132	Phosphate rock, argillaceous	DPS-2438	0.3	18.0	44.1	82.60	509.88
P-131	Mudstone, phosphatic	DPS-2437	0.75	8.2	59.2	83.35	516.04
P-130	Mudstone, phosphatic	DPS-2436	0.6	10.2	59.2	83.95	522.16
P-129	Mudstone, phosphatic	DPS-2435	0.9	8.1	64.3	84.85	529.44
P-128	Mudstone	DPS-2434	2.3	7.5	68.8	87.15	546.70
P-127	Mudstone, phosphatic	DPS-2433	2.1	7.9	66.0	89.25	563.28
P-126	Mudstone, phosphatic	DPS-2432	0.6	9.0	61.2	89.85	568.68
P-125	Mudstone	DPS-2431	0.6	5.7	60.0	90.45	572.10
P-124	Mudstone	DPS-2430	1.35	7.7	64.8	91.80	582.50
P-123	Mudstone	DPS-2429	0.75	7.6	64.3	92.55	588.20
P-122	Mudstone, phosphatic	DPS-2428	0.7	8.6	64.5	93.25	594.22
P-121	Mudstone, phosphatic	DPS-2427	0.9	8.2	63.8	94.15	601.60
P-120	Mudstone	DPS-2426	1.6	7.7	67.0	95.75	613.92
P-119	Mudstone, phosphatic	DPS-2425	0.95	10.5	57.0	96.70	623.90
P-118	Mudstone	DPS-2424	1.4	7.2	63.0	98.10	633.98
P-117	Mudstone, phosphatic	DPS-2423	0.55	8.0	63.7	98.65	638.38
P-116	Mudstone, phosphatic	DPS-2422	0.75	8.4	66.7	99.40	644.68
P-115	Mudstone and phosphate rock	DPS-2421	0.6	11.4	55.7	100.00	651.52
P-114	Mudstone, phosphatic	DPS-2420	0.6	10.5	59.2	100.60	657.82
P-113	Mudstone, phosphatic	DPS-2419	0.3	14.3	50.0	100.90	662.10
P-112	Phosphate rock, argillaceous	DPS-2418	0.3	17.8	43.0	101.20	667.44
P-111	Mudstone, phosphatic	DPS-2417	0.75	9.3	66.2	101.95	674.42
P-110	Mudstone, phosphatic	DPS-2416	0.8	9.2	64.8	102.75	681.78
P-109	Mudstone, phosphatic	DPS-2415	0.7	9.5	61.1	103.45	688.43

P-108	Mudstone, phosphatic	DPS-2414	0.7	10.4	56.2	104.15	695.71
P-107	Limestone, argillaceous	DPS-2413	0.65	4.9	38.7	104.80	698.90
P-106	Mudstone, phosphatic	DPS-2412	1.1	9.1	63.3	105.90	708.90
P-105	Mudstone, phosphatic	DPS-2411	1.55	10.2	62.9	107.45	724.72
P-104	Mudstone, phosphatic	DPS-2410	0.5	8.2	62.9	107.95	728.82
P-103	Mudstone, phosphatic	DPS-2409	2.0	8.5	65.0	109.95	745.82
P-102	Phosphate rock, argillaceous	DPS-2408	0.6	19.5	39.0	110.55	757.52
P-101	Mudstone	DPS-2407	0.95	6.5	65.5	111.50	763.69
P-100	Mudstone	DPS-2406	0.55	6.5	67.5	112.05	767.26
P- 99	Mudstone	DPS-2405	0.75	2.6	52.6	112.80	769.22
P- 98	Mudstone, phosphatic	DPS-2467	0.5	7.8	62.0	113.30	773.12
P- 97	Mudstone, calcareous	DPS-2466	0.5	6.3	53.5	113.80	776.27
P- 96	Mudstone	DPS-2465	0.85	7.2	59.8	114.65	782.38
P- 95	Mudstone	DPS-2404	1.1	6.8	62.9	115.75	789.86
P- 94	Mudstone	DPS-2403	0.65	5.5	66.7	116.40	793.44
P- 93	Mudstone	DPS-2402	0.6	5.4	67.1	117.00	796.68
P- 92	Mudstone, phosphatic	DPS-2401	0.35	10.4	54.6	117.35	800.32
P- 91	Mudstone, phosphatic	DPS-2400	0.8	8.2	57.9	118.15	806.88
P- 90	Mudstone, calcareous	DPS-2399	0.95	5.8	56.0	119.10	812.39
P- 89	Mudstone	DPS-2398	1.4	6.6	60.1	120.50	821.63
P- 88	Mudstone, calcareous	DPS-2397	3.0	5.2	62.0	123.50	837.23
P- 87	Mudstone, calcareous	DPS-2396	0.6	6.5	58.4	124.10	841.13
P- 86	Mudstone, phosphatic, calcareous	DPS-2395	0.55	11.7	46.4	124.65	847.56
P- 85	Mudstone, calcareous	DPS-2394	2.5	5.1	58.1	127.15	860.32
P- 84	Mudstone, calcareous	DPS-2393	0.5	5.7	53.6	127.65	863.16
P- 83	Mudstone, phosphatic, calcareous	DPS-2392	0.65	9.2	48.8	128.30	869.14
P- 82	Phosphate rock, argillaceous, calcareous	DPS-2391	0.3	14.9	35.8	128.60	873.62
P- 81	Limestone, argillaceous	DPS-2390	0.95	4.9	30.8	129.55	878.27
P- 80	Mudstone, calcareous	DPS-2389	1.55	7.7	48.5	131.10	890.20
P- 79	Mudstone, phosphatic	DPS-2388	0.35	14.7	41.7	131.45	895.35
P- 78	Mudstone, calcareous	MDS-2523	0.5	6.4	57.1	131.95	898.55
P- 77	Mudstone, calcareous	MDS-2522	0.7	5.3	60.1	132.65	902.26
P- 76	Mudstone, calcareous	MDS-2521	0.75	6.8	53.3	133.40	907.36
P- 75	Mudstone, calcareous, phosphatic	MDS-2520	0.9	8.0	56.5	134.30	914.56
P- 74	Mudstone, calcareous, phosphatic	MDS-2519	0.4	9.4	47.0	134.70	918.32
P- 73	Phosphate rock, argillaceous	GFH-2530	0.7	20.5	38.5	135.40	932.67
P- 72	Mudstone	GFH-2529	0.3	2.2	82.3	135.70	933.33
P- 71	Mudstone, calcareous	GFH-2528	2.0	1.2	73.2	137.70	935.73
P- 70	Mudstone, cherty, calcareous	GFH-2527	0.65	1.8	69.3	138.35	936.90
P- 69	Mudstone, calcareous	GFH-2526	0.85	2.4	64.3	139.20	938.94
P- 68	Mudstone, calcareous, contains pyrite	GFH-2600	0.5	4.6	60.0	139.70	941.24
P- 67	Mudstone, calcareous	GFH-2599	2.6	1.7	65.8	142.30	945.66
P- 66	Phosphate rock and mudstone	GFH-2598	0.5	23.2	30.0	142.80	957.26
P- 65	Phosphate rock, argillaceous	GFH-2597	1.0	18.5	33.7	143.80	975.76

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
P- 64	Limestone, argillaceous	MDS-2518	2.3	0.4	34.2	146.10	976.68
P- 63	Mudstone, calcareous	MDS-2514	2.5	1.7	52.3	148.60	980.93
P- 62	Mudstone, calcareous	MDS-2516	1.2	3.0	54.5	149.80	984.53
P- 61	Limestone, argillaceous	MDS-2515	1.1	1.7	43.8	150.90	986.40
P- 60	Mudstone, calcareous	MDS-2514	0.6	1.8	52.0	151.50	987.48
P- 59	Mudstone, calcareous	DPS-2464	0.65	3.0	60.3	152.15	989.43
P- 58	Mudstone, calcareous	DPS-2463	1.2	4.3	60.8	153.35	994.59
P- 57	Limestone, argillaceous, cherty	DPS-2462	0.7	1.5	46.2	154.05	995.64
P- 56	Mudstone, calcareous	DPS-2461	0.95	3.5	63.8	155.00	998.96
P- 55	Mudstone, cherty	DPS-2460	0.55	2.2	75.2	155.55	1,000.18
P- 54	Mudstone, cherty, calcareous	DPS-2459	0.75	1.4	64.0	156.30	1,001.22
P- 53	Mudstone, calcareous	DPS-2458	0.5	4.0	65.2	156.80	1,003.22
P- 52	Mudstone, cherty, calcareous	DPS-2457	0.75	1.4	70.3	157.55	1,004.28
P- 51	Mudstone, calcareous, cherty	DPS-2456	0.55	1.6	62.9	158.10	1,005.16
P- 50	Mudstone, calcareous	DPS-2455	0.85	2.2	67.1	158.95	1,007.03
P- 49	Mudstone, calcareous	DPS-2454	0.8	2.4	67.1	159.75	1,008.94
P- 48	Mudstone, cherty, calcareous	DPS-2453	0.5	1.5	70.0	160.25	1,009.70
P- 47	Mudstone, cherty, calcareous	DPS-2452	0.7	1.5	60.6	160.95	1,010.74
P- 46	Mudstone, calcareous	MDS-2513	0.4	2.6	58.7	161.35	1,011.78
P- 45	Mudstone, cherty, calcareous	MDS-2512	0.5	1.2	65.2	161.85	1,012.38
P- 44	Mudstone, calcareous	MDS-2511	0.3	2.3	56.8	162.15	1,013.08
P- 43	Mudstone, calcareous	MDS-2510	0.95	1.6	68.2	163.10	1,014.60
P- 42	Mudstone, cherty, calcareous	MDS-2509	0.5	1.3	72.9	163.60	1,015.24
P- 41	Mudstone, calcareous	MDS-2508	0.6	2.4	70.7	164.20	1,016.68
P- 40	Mudstone, cherty, calcareous	MDS-2507	1.3	2.0	67.3	165.50	1,019.28
P- 39	Mudstone, calcareous	MDS-2506	0.6	2.9	67.3	166.10	1,021.02
P- 38	Mudstone, calcareous	MDS-2505	0.5	5.3	63.5	166.60	1,023.68
P- 37	Mudstone, calcareous	MDS-2504	0.7	1.5	66.0	167.30	1,024.72
P- 36	Mudstone, cherty, calcareous	MDS-2503	0.9	1.1	64.0	168.20	1,025.72
P- 35	Mudstone, calcareous	MDS-2502	0.8	1.4	69.7	169.00	1,026.84
P- 34	Mudstone, calcareous	MDS-2501	0.9	1.1	71.5	169.90	1,027.82
P- 33	Mudstone, calcareous	MDS-2500	0.4	2.0	71.8	170.30	1,028.62
P- 32	Mudstone, calcareous	MDS-2499	1.1	1.4	66.5	171.40	1,030.16
P- 31	Mudstone, calcareous	MDS-2498	0.55	1.5	75.7	171.95	1,030.99
P- 30	Mudstone, calcareous	MDS-2497	0.7	1.2	73.3	172.65	1,031.83
P- 29	Mudstone	MDS-2496	0.7	3.0	76.0	173.35	1,033.93
P- 28	Mudstone, cherty, calcareous	MDS-2495	0.95	1.5	68.8	174.30	1,035.36
P- 27	Mudstone, calcareous	MDS-2494	1.6	1.2	74.2	175.90	1,037.28
P- 26	Mudstone, calcareous	MDS-2493	1.2	1.2	70.5	177.10	1,038.72
P- 25	Mudstone, calcareous	MDS-2492	1.0	1.5	72.8	178.10	1,040.22

P- 24	Mudstone, calcareous	MDS-2491	0.8	1.8	72.5	178.90	1,041.66
P- 23	Mudstone, calcareous	MDS-2490	0.9	1.0	64.5	179.80	1,042.56
P- 22	Mudstone, calcareous	MDS-2489	1.75	1.6	68.6	181.55	1,045.36
P- 21	Mudstone	MDS-2488	1.1	1.7	76.2	182.65	1,047.23
P- 20	Mudstone, calcareous	MDS-2487	0.5	2.1	56.9	183.15	1,048.28
P- 19	Mudstone, calcareous	MDS-2486	0.35	1.7	63.3	183.50	1,048.87
P- 18	Mudstone, calcareous	MDS-2485	0.6	7.3	57.5	184.10	1,053.25
P- 17	Mudstone, calcareous	MDS-2484	1.1	1.7	57.3	185.20	1,055.12
P- 16	Mudstone, calcareous	MDS-2483	4.0	2.5	63.0	189.20	1,065.12
P- 15	Limestone, argillaceous	MDS-2482	2.6	1.4	43.8	191.80	1,068.76
P- 14	Mudstone, calcareous	MDS-2481	3.85	3.1	67.8	195.65	1,080.70
P- 13	Mudstone, calcareous	MDS-2480	3.45	2.0	59.3	199.10	1,087.60
P- 12	Mudstone, calcareous	MDS-2479	0.55	2.4	65.5	199.65	1,088.92
P- 11	Mudstone, calcareous	MDS-2478	0.75	2.8	72.7	200.40	1,091.02
P- 10	Mudstone, calcareous	MDS-2477	1.4	1.6	62.5	201.80	1,093.26
P- 9	Limestone, argillaceous	MDS-2476	0.4	4.1	34.8	202.20	1,094.90
P- 8	Mudstone, calcareous	MDS-2200	1.5	2.6	61.7	203.70	1,098.80
P- 7	Limestone, argillaceous	MDS-2199	1.0	1.9	42.8	204.70	1,100.70
P- 6	Mudstone, calcareous	MDS-2198	0.75	5.5	55.2	205.45	1,104.82
P- 5	Phosphate rock, argillaceous	MDS-2197	0.7	16.5	39.7	206.15	1,116.37
P- 4	Phosphate rock, calcareous, argillaceous	MDS-2196	0.65	12.7	28.5	206.80	1,124.62
P- 3	Phosphate rock, calcareous, argillaceous	MDS-2195	0.65	21.8	21.0	207.45	1,138.80
P- 2	Phosphate rock, argillaceous	MDS-2194	1.0	18.85	32.0	208.45	1,157.60
P- 1	Phosphate rock	MDS-2193	0.7	31.0	3.3	209.15	1,179.30
	Lower member of Park City formation—top beds only						
L- 5	Limestone	MDS-2192	1.9	1.0	9.3	1.9	--
L- 4	Limestone	--	2.4	--	--	4.3	--
L- 3	Limestone, dolomitic	--	1.2	--	--	5.5	--
L- 2	Limestone, cherty	--	10.0	--	--	15.5	--
L- 1	Limestone, cherty	--	0.5	--	--	16.0	--

ALTA QUADRANGLE, UTAH. LOT NO. 1284.

Samples collected by F. C. Calkins from base of Deseret limestone in the Alta quadrangle, Utah, in September 1948, samples FCC(A)1107 and FCC(B)1108 from ridge between Solitude and Honeycomb Forks and sample FCC(B)1109 from crest of Kessler Peak Ridge. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oregon.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)						Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	V_2O_5	Loss on ignition	Acid insoluble		
--	Limestone	FCC(A)1107	--	0.8	3.5	1.6	0.05	31.8	16.3	--	--
--	Limestone	FCC(B)1108	--	2.2	1.3	0.4	0.05	39.1	7.1	--	--
--	Phosphate rock, calcareous	FCC(C)1109	--	25.7	0.6	0.5	0.05	14.0	6.6	--	--

SPECTROGRAPHIC ANALYSES—ALTA QUADRANGLE, UTAH. LOT NO. 1284.

Semi-quantitative analyses of samples from the base of the Deseret limestone, Alta quadrangle, Utah (see above for location of section, thickness and description of strata, and chemical analyses of Samples), made by U. S. Bureau of Mines Laboratory, Albany, Oregon. In addition to the elements listed in the table below, Sb, As, Ba, Be, Bi, B, Cd, Co, Cb, Ga, Ge, Au, In, Pb, Li, Hg, Pt, Ag, Ta, Sn, W, and Zn were looked for in all samples but were not detected.

Explanation of symbols

A = more than 10 percent
B = 5-10 percent
C = 1-5 percent
D = 0.1-1 percent
E = 0.01-0.1 percent
F = 0.001-0.01 percent
G = less than 0.001 percent
ND = not detected

Bed no.	Sample no.	Al	Ca	Cr	Cu	Fe	Mg	Mn	Mo	Ni	Si	Na	Sr	Ti	V	Zr
--	FCC(A)1107	C	B	E	G	C	C	F	ND	E	B	ND	F	E	E	F
--	FCC(B)1108	C	A	E	G	D	C	F	F	E	C	ND	E	E	D	F
--	FCC(C)1109	C	A	E	G	C	C	F	F	F	C	E	F	E	E	F